Advant® OCS
with Master software

Functional Units Part 4
PIDCON RATIOSTN MANSTN

User's Guide

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Chapter 1 Introduction

1.1 General

The function library available in an ABB Advant Controller 400 Series installation includes an extensive range of different data base elements and PC elements. A required control function can be built up with the AMPL language (ABB Master Programming Language).

Functional units are available to supplement the library for more complex functions. The functional unit is a “package” of different program functions (such as PC elements and data base elements).

Each functional unit has a specific communication module for connection to the Operator station (for control and supervision). The operators handling in the Operator Station has a function adapted dialog. Standardized display elements are used for visual indications.

The packaging simplifies documentation and implementation of, for example, functions with both control function and associated operators actions via display screen and keyboard. PC elements and functional units can be used freely together.

Applications include feedback control, sequence control and motor/valve controls.

The functional units are constituted of pre-prepared parts. These consist of different control functions or interfaces to a user designed control function and different operators, alarm and event handling functions.

The descriptions of the functional units for process signal connections, AI, AO, DI, DO include a certain hardware function to give a complete picture of the function. All other functional units are completely implemented in software.

NOTE

General knowledge of the Advant Controller 410/450 and Advant Station 500 Series Operator Station systems is required to fully understand the contents of this manual.

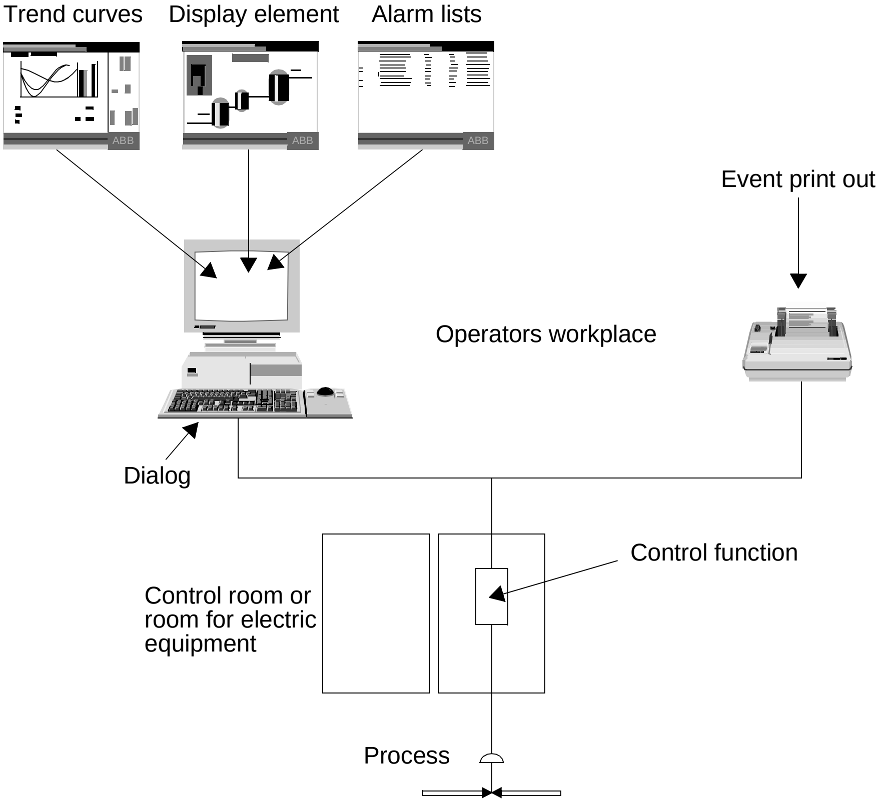


Figure 1-1. Software functions which can be included in a functional unit

1.2 Structure of the Manual

The manual, Functional Units, is for practical reasons divided into seven (7) physical parts. The contents of these seven parts are:

Part 1	Common Properties
Part 2	AI AO DI DO
Part 3	SEQ GROUP
Part 4	PIDCON RATIOSTN MANSTN
Part 5	GENCON GENBIN GENUSD
Part 6	MOTCON VALVECON
Part 7	PIDCONA

Functional Units Part 1 Common Properties, may be read first, in order to define the Functional Unit philosophy. This part also includes descriptions of common properties, valid for all Functional Units.

Part 2 to 7 do not have to be read in part number order. Each part stand by itself (together with part 1). A reader can start with Part 1 and then succeed with the part most urgent.

The contents of the different parts are:

Functional Units Part 1

- General descriptions of the functional units
- Descriptions of common system functions

Functional Units Part 2

- AI (Analog Input). The functional unit AI (Analog Input) incorporates functions for:
  - Scanning of analog and pulse train inputs from the process
  - Filtering, linearization and scaling of such inputs
  - Storage of such inputs or internally calculated analog variables
  - Update blocking and input simulation
  - Limit checking
  - Operator station functions
  - Internal and external alarm detection and handling.
- AO (Analog Output). The functional unit AO (Analog Output) incorporates functions for:
  - Output signal storage and updating
  - Auto and manual modes of control
  - Limit checking prior to storage
  - Scaling and output of an analog control signal to the process
  - Operator station functions.
- DI (Digital Input). The functional unit DI (Digital Input) incorporates functions for:
  - Scanning of digital process inputs.
  - Filtering and inversion of such inputs.
  - Storage of input data
  - Update blocking and input simulation
  - Operator station functions.

- DO (Digital Output). The functional unit DO (Digital Output) incorporates functions for:
  - Output signal storage and updating
  - Auto and Manual modes of control
  - Inversion of stored data prior to output
  - Output of a digital control signal to the process
  - Operator station functions.

Functional Units Part 3

- SEQ (Sequence).
  - SEQ (Sequence) is a software package - a functional unit - designed for universal use in sequence applications.
- GROUP (Group).
  - GROUP (Group) is used for group-start and group-stop of motors, valves and other binary objects coordinated as a group in the process. These objects are normally controlled by MOTCON or VALVECON with which GROUP is compatible.

Functional Units Part 4

- PIDCON
  - PIDCON has been developed for control functions in different processes. It is therefore called a process controller.
- RATIOSTN
  - RATIOSTN is mainly intended for ratio control. This ratio control is performed in cooperation with a process controller PIDCON or PIDCONA.
- MANSTN
  - MANSTN is intended for control of unregulated objects.

Functional Units Part 5

- GENCON
  - GENCON (GENeral object CONtroller) is a general tool which enables the user to create desired control functions. This Functional Unit include a User Defined PC Program.
- GENBIN
  - GENBIN (GENeral object BINary controller) is a general tool which enables the user to create desired control functions. This Functional Unit include a User Defined PC Program.
- GENUSD
  - GENUSD (GENeral object USer Defined controller) is a general tool which enables the user to create desired control functions. This Functional Unit include a User Defined PC Program.

Functional Units Part 6

- MOTCON
  - MOTCON is a functional unit designed for the control of motors in different processes.
- VALVECON
  - VALVECON is a functional unit designed for the control of 2-position valves in different processes.

Functional Units Part 7

- PIDCONA
  - PIDCONA is a complete PID control function with autotuning and adaptive control, including functions for operator interface and event handling.

1.3 Purpose of the Manual

The purpose of this manual is to give the Advant Controller 400 Series implementer information about the powerful library of predefined function units “packages”, in order to provide all the information needed for the use of the different functional units.

Functional Units Part 1 contains the following information:

- General descriptions of the functional units
- Descriptions of common system functions

The other six parts include

- Detailed descriptions of the design and function of the different functional units
- Examples of applications

1.4 Other documentation

In addition to the unified documentation for the functional units offered by these series of Function Units Parts (part 1-7), there are other manuals which document individual types of program functions within a functional unit. There is, for example, a reference manual, *PC Elements Advant Controller 400 Series Reference Manual* which embraces all of the PC elements included in the controller. The PC elements contained in any particular functional unit are also included in this. A corresponding manual is available for data base elements, *Data Base Elements Advant Controller 400 Series Reference Manual*. Both are valuable aids for practical use in the day-to-day design work, when knowledge of the function is available. Information in this manual is based on the following documents:

- *PC Elements Advant Controller 400 Series Reference Manual*
- *Data Base Elements Advant Controller 400 Series Reference Manual*
- *AdvaCommand Basic Functions User’s Guide*
- *AdvaCommand User Interface Reference Manual*
- *MasterPiece 280 Application Notes*

Chapter 2 PIDCON

2.1 General

The functional unit PIDCON has been developed for control functions in different processes. It is therefore called a process controller.

A PIDCON controller normally performs a complete control function independently.

For certain control tasks however, a PIDCON controller requires supplementary functions. Such tasks include

- Ratio control (control of the relation between, for example, different flows). The PIDCON is then supplemented with a ratio station (RATIOSTN).
- Increase/decrease control. The PIDCON is then supplemented with a three-position controller (CON-PU1).
- Special control (differing from traditional control functions). PIDCON can here be supplemented with optional combinations from the complete range of PC elements. This means that solutions can be developed to solve unusual control problems.

Characteristic Properties

The following functions and properties are characteristic of the PIDCON process controller:

- Optional P-, PI-, PD- or PID-algorithm
- Control parameters can be determined from the operator's control station or controlled from the PC program (e.g. gain scheduling)
- Control modes: BAL, MAN, AUTO and different cascade alternatives
- Automatic functions including the logic for allocation of priority in the selection of control mode
- Setpoint handling with different versions of tracking
- Controllable rate of change of all setpoints and manual output signals
- The possibility of limiting setpoints and output signals
- Integrated functions for bumpless change between different control modes
- The possibility of forced control of the output signal with different priorities
- Alarm or event-handling of the more important control signals.

Examples of properties

Figure 2-1 illustrates some of the properties of the process controller.

- The controller can be controlled automatically to a suitable control mode with start and stop sequences. This is performed in accordance with a specific orderof priority in an internal function block (CONTROL MODE) in the process controller.
- If, in a process, there is the risk of overheating emergency cooling becomes necessary. A valve is then to be opened for cooling. The overheating status is detected by the controller (through the input clamping on). The output signal adopts a clamping value which in this example is 100%. The valve opens completely.
- If the flow falls below a preset limit when the process pump is in operation, an emergency pump is to start. The controller monitors the signal from the flow-meter received through the measured value input. When this value falls below the limit L an active alarm signal is obtained. The emergency pump starts.

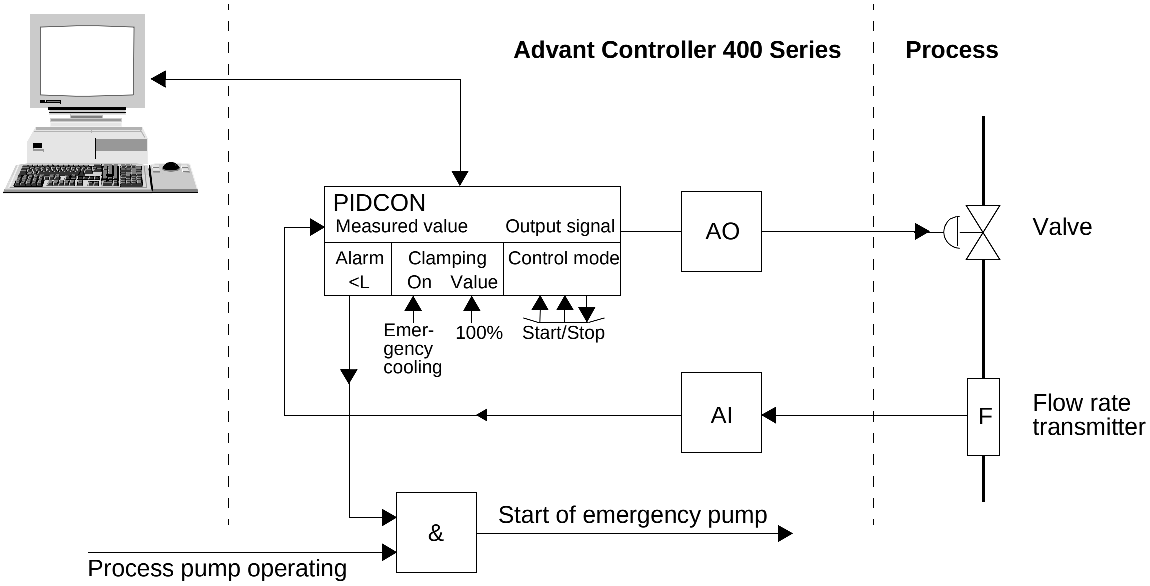


Figure 2-1. Example of process controller application

2.2 Configuration

Process controller PIDCON consists of PC element, data base element and operator functions. The configuration is described in Part 1 of the manuals for functional units. Figure 2-2 repeats the illustration from Part 1.

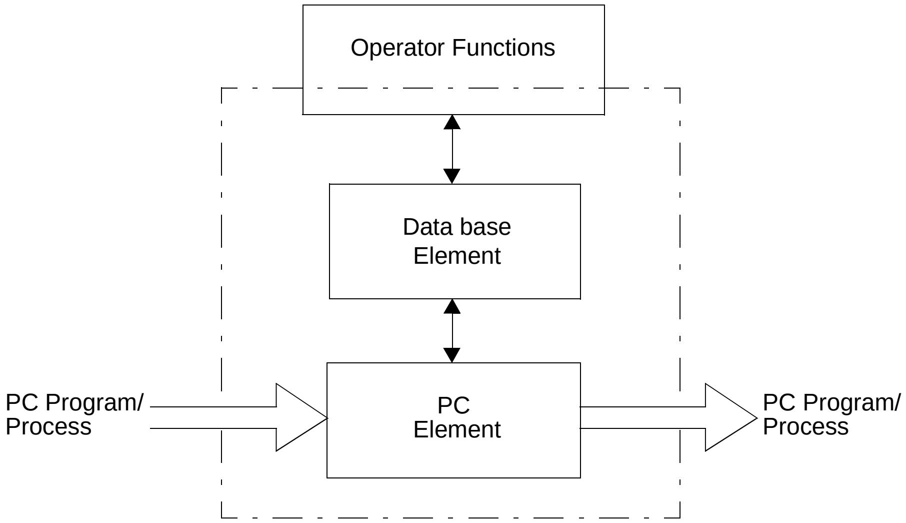


Figure 2-2. Principle of PIDCON configuration

Figure 2-3 and Figure 2-4 show the complete symbols for PC elements and data base elements respectively.

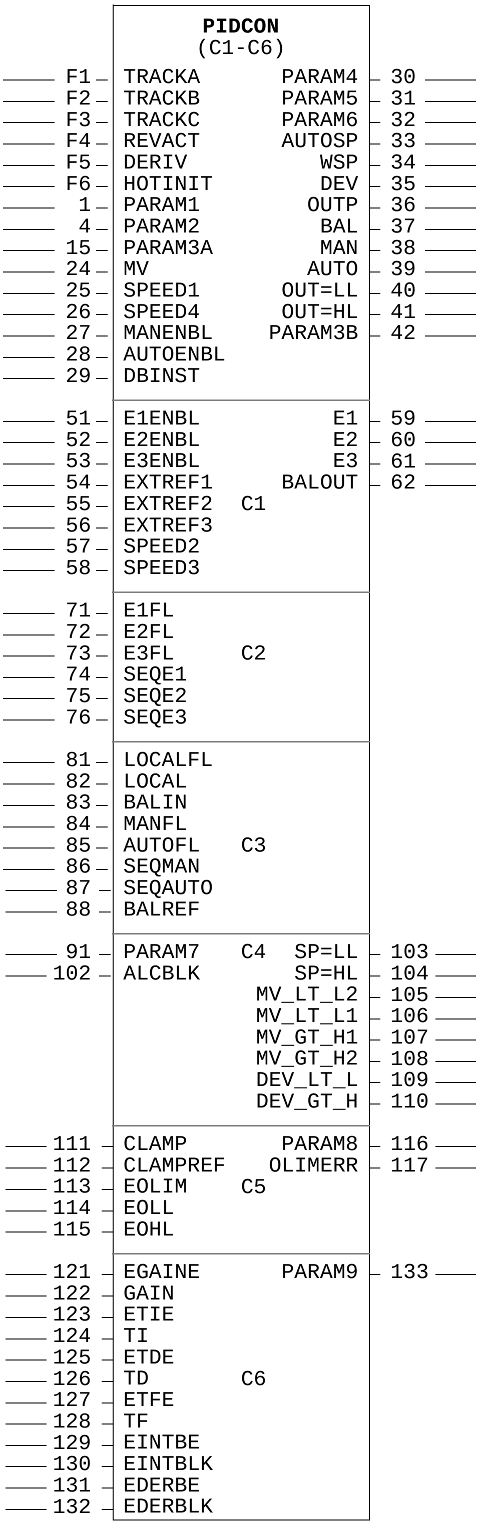


Figure 2-3. PC element, complete symbol

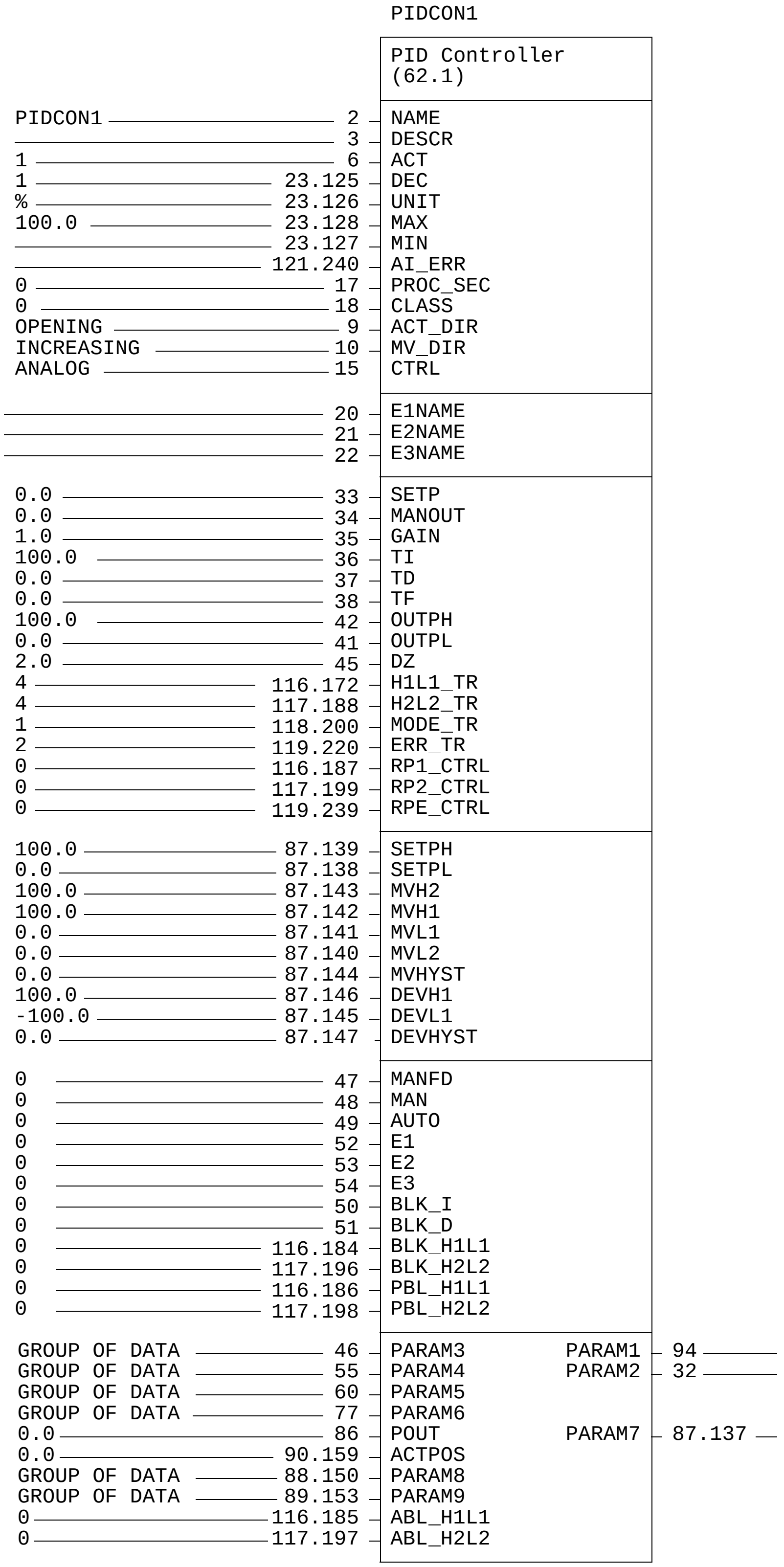


Figure 2-4. Data base element, complete symbol

2.3 Function

The capabilities of the PIDCON process controller are the result of the interaction of a combination of a number of subfunctions.

To understand the capabilities of the process controller, knowledge of the subfunctions and their connections is required.

This section describes the basic properties of the process controller. The section presents a function block diagram of the controller.

The subfunctions within each block in the function block diagram are described in detail in Section 2.3.2 Control Mode - Section 2.3.10 Alarm and Limitation Functions.

2.3.1 Basic Properties

Figure 2-5 presents a function block diagram of the process controller. All blocks below MMC/DATA BASE ELEMENT are included in the PC element.

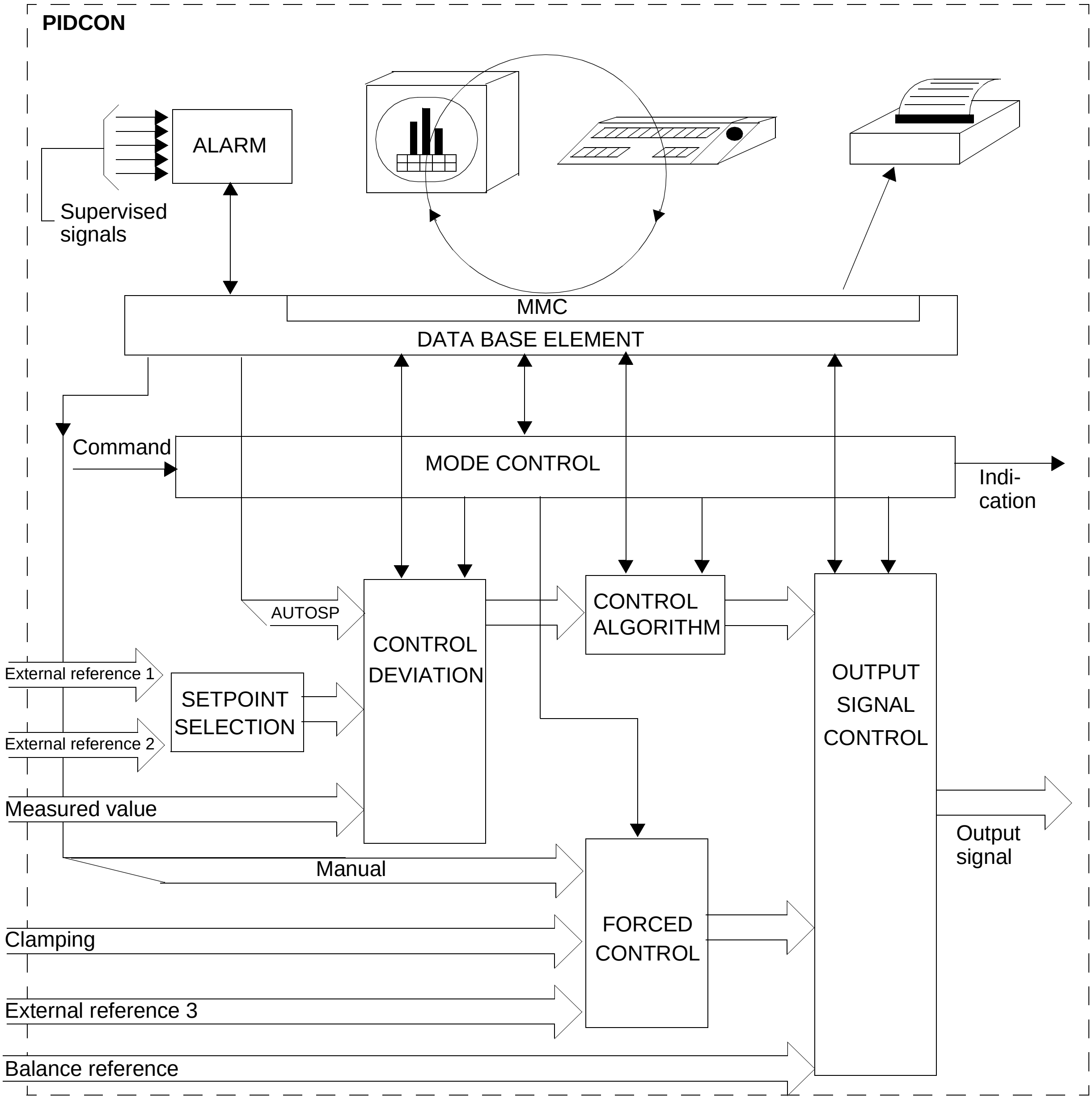


Figure 2-5. Function block diagram PIDCON

The properties of the process controller are obtained through the functions described in the following:

A command for the required control mode is given by the operator or from other PC elements. The control signal functions are notified of the control mode selected. The display screen and printer, if relevant, are also notified of this via the data base element and operator functions. The signal is also available for other purposes such as remote indication of the control mode.

The control mode selected determines the processing of the signals in the process controller. The functions are therefore described separately for each of the different control modes and for forced control to a locking value.

Certain common properties should be mentioned before these functions are described.
(The figures within parentheses indicate the section which deals with the function concerned):

- The output signal can be subject to limitation of highest and lowest value. These limitations can be determined either from the operator's keyboard from some other PC element or from an external control device (Section 2.3.8 Output Signal Control).
- The rate of change of the output signal can be subject to limitation (Section 2.3.4 Ramp Function).
- The output signals are always bumpless when changing control mode (PI(D)-controller).
- The tracking functions can be utilized on the setpoints which do not apply. Changing control mode with constant output signal value (PI(D)-controller) can be obtained in this way (Section 2.3.5 Control Deviation).

Function Description BAL

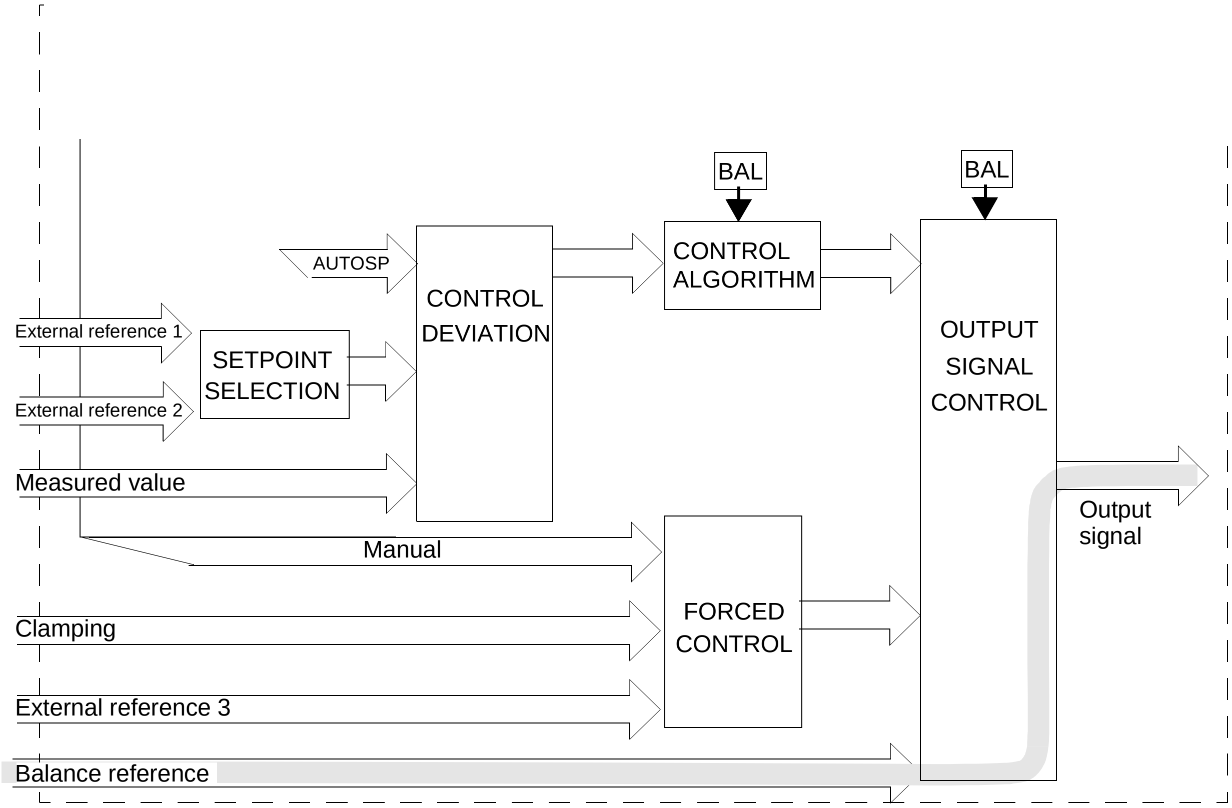


Figure 2-6. Signal flow with control mode BAL

When the controller is operating in the BAL (BALance) control mode, the output signal follows a balance reference signal which is connected to a PC input. The operator cannot command the BAL control mode from the keyboard. The command is received either from an external control device or from some other PC element.

NOTE

The BAL control mode is used when the control signal is disconnected and the controller is to be balanced for bumpless return.

Examples of use:

- Manual emergency control, with the highest priority, from a local backup station, for example immediately adjacent to the process function. An operator, working centrally at the display screen cannot take over control.
- When another PC element than the process controller is to take over the control.
- In connection with cascade coupling of several process controllers.

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
Balance reference	BALREF	PC-C3:88
Output signal	OUTP	PC-C0:36

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 2-3.

Function Description MAN

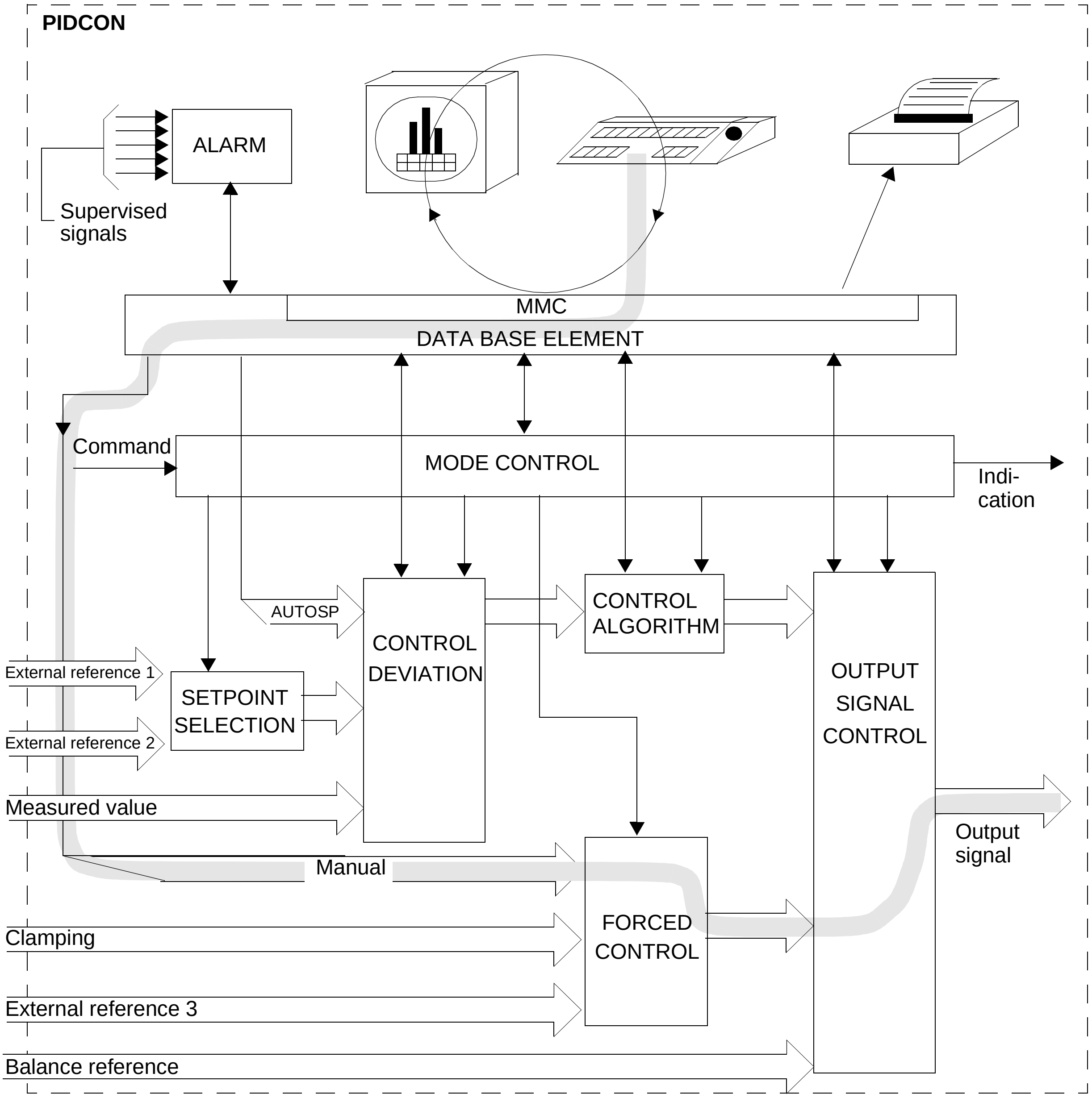


Figure 2-7. Signal flow with control mode MAN

With control mode MAN (MANual) the output signal is controlled by the operator, via the keyboard. The control mode can be commanded from the operator’s keyboard, from another PC element or from an external control device.

The control mode MAN can also be commanded automatically on the occurrence of events which activate forced control to a locking value and on receiving an incorrect signal from an analog input (AI). These automatic commands are described below under the headings Clamping of output signal value and Section 2.3.2 Control Mode.

The control mode MAN can be locked to prevent change to another control mode. This locking is commanded from the operator’s keyboard (described below under the heading Control Mode).

NOTE

> The control mode MAN is used when manual control is required from the operator’s keyboard.

Examples of use:

- Manual control of an actuator under abnormal operation conditions e.g. in connection with a malfunction.
- Manual control at start and stop.

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
Manual output	MANOUT	DB-S3:34
Output signal	OUTP	PC-C0:36

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 2-3.

Function Description AUTO

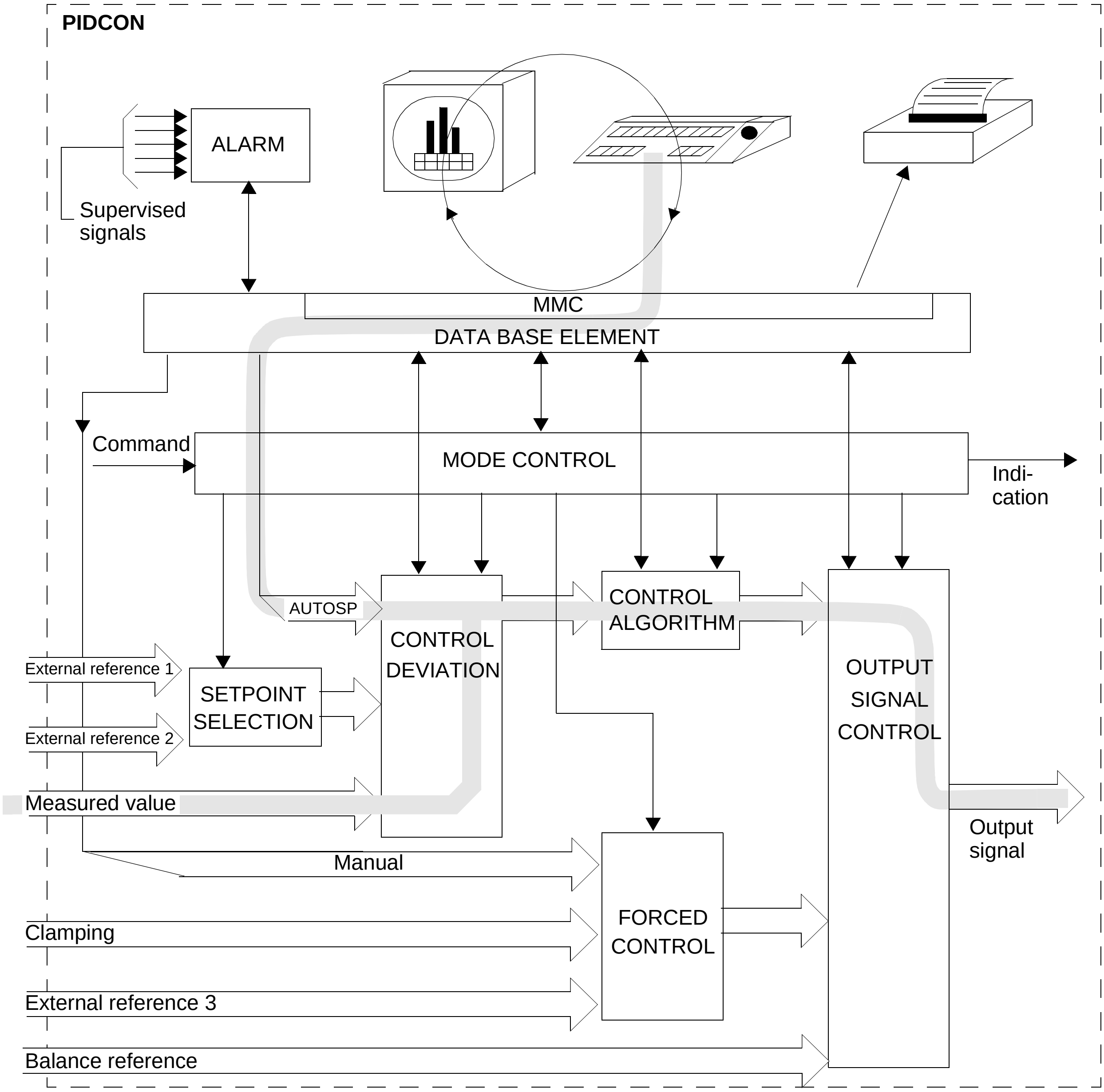


Figure 2-8. Signal flow with control mode AUTO

With the control mode AUTO (AUTOmatic), the setpoint is determined by the operator via the keyboard. The difference between the AUTO setpoint and the measured value from the process gives the control deviation. This is processed in accordance with the P-, PI-, PD- or PID-algorithm which applies. The result of this processing is applied to the output signal.

The control mode AUTO can be commanded from the operator’s keyboard, from another PC element or from an external control device.

NOTE

The control mode AUTO is used when control is required with a setpoint set from the operator’s keyboard.

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
Measured Value	MV	PC-C0:24
Output signal	OUTP	PC-C0:36

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 2-3.

Function Description E1

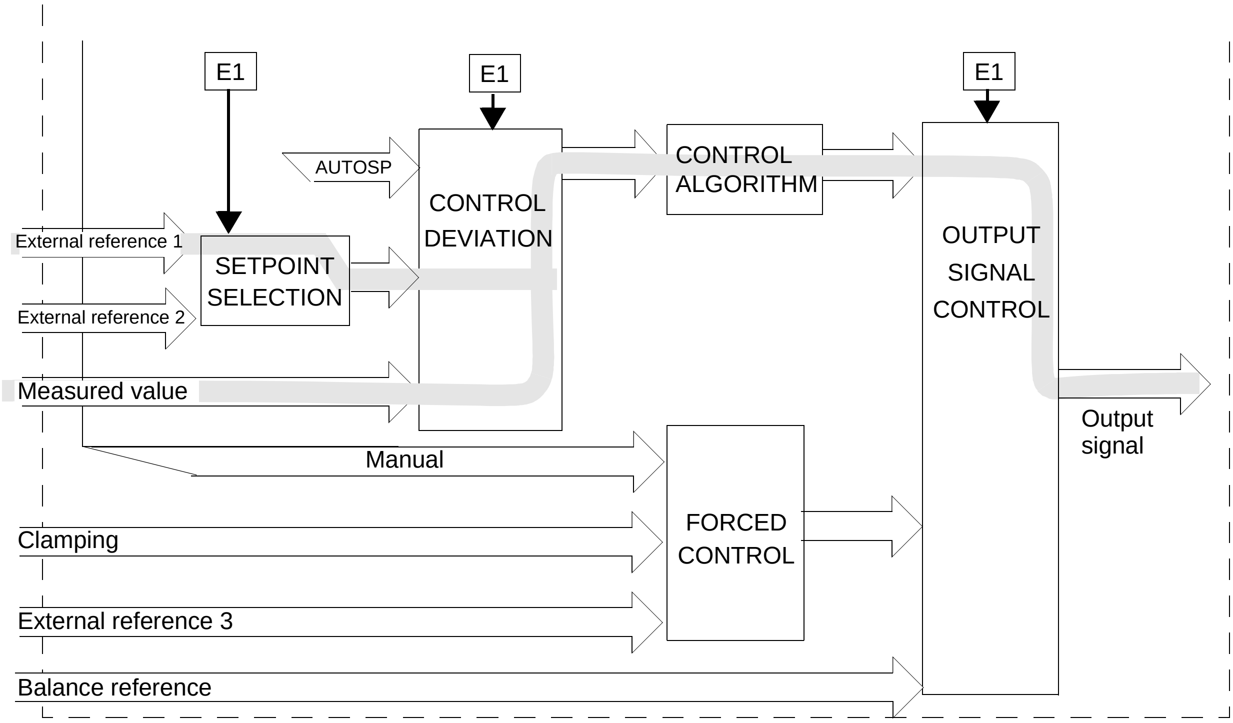


Figure 2-9. Signal flow with operation mode E1

With control mode E1 (External 1) the setpoint consists of a signal received from an external source, External reference 1. The difference between this setpoint and the measured value gives the control deviation. This is processed in accordance with the P-, PI-, PD- or PID algorithms selected. The result of this processing is the output signal.

The control mode E1 can be commanded from the operator's keyboard, from another PC element or from an external control device.

NOTE

> The control mode E1 is used when control is required with a setpoint which is obtained from an external source.

Examples of use:

- Cascade control.
- Setpoint control from an optimizing function.
- Local setting of setpoint.
- Recipe-controlled setpoint.

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
External Reference 1	EXTREF1	PC-C1:54
Measured Value	MV	PC-C0:24
Output signal	OUTP	PC-C0:36

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

Function Description E2

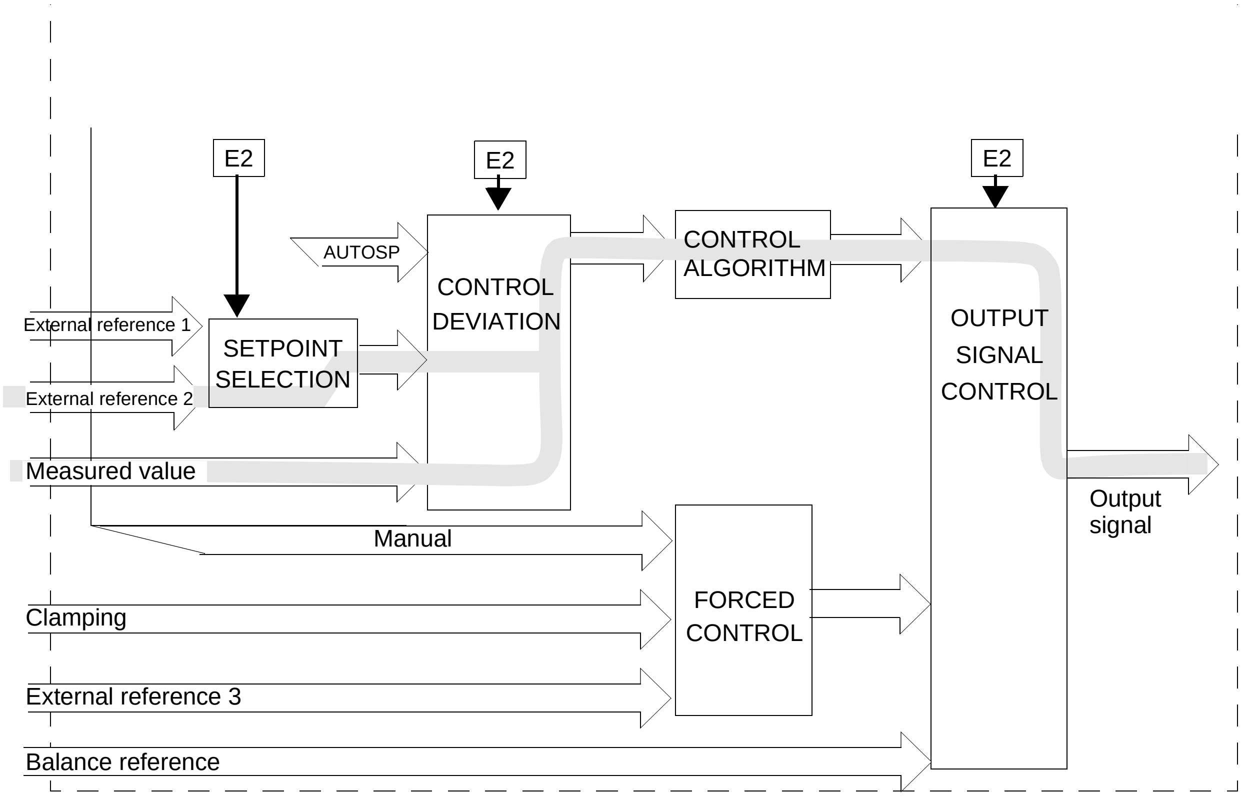


Figure 2-10. Signal flow with control mode E2

Control mode E2 functions in exactly the same way as E1. The setpoint consists here however of the external reference 2. The setpoint used is selected in SETPOINT SELECTION.

NOTE

Control Mode E2 is used in the same way as E1.

The control modes E1 and E2 make it convenient (from the controllers dialog) to select between two external reference sources. The two external reference inputs can be given different ramp times.

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
External reference 2	EXTREF2	PC-C1:55
Measured Value	MV	PC-C0:24
Output signal	OUTP	PC-C0:36

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

Function Description E3

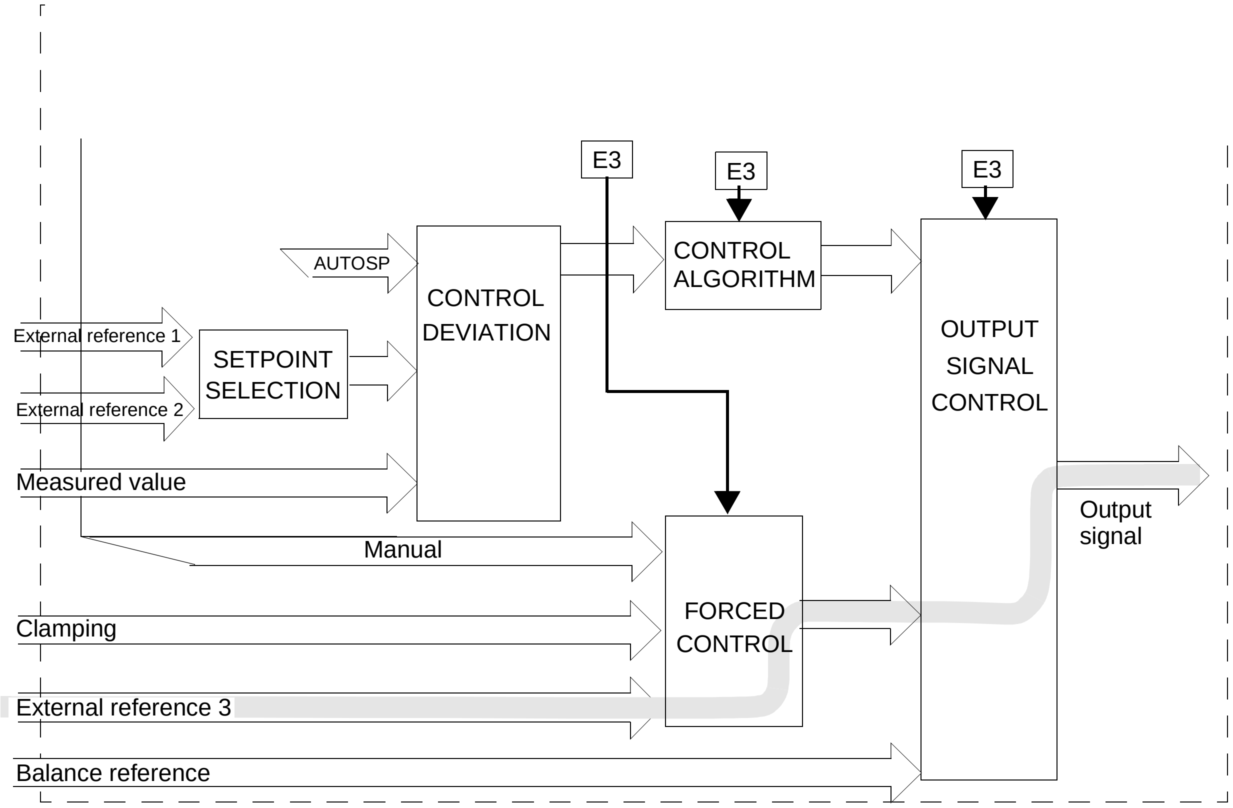


Figure 2-11. Signal flow with control mode E3

With the control mode E3, External 3, the output signal is forced to follow an external reference signal.

The control mode E3 can be commanded from the operator’s keyboard, from some other PC element or from an external control device.

NOTE

Control mode E3 is used when forced control is required from a place other than the operator’s keyboard.

Examples of use:

- When it is desirable to control the output signal with low priority e.g. from a local operator's station or from a PC. The responsibility for the control can then always be taken over at a central operator's station.
- In connection with traditionally named DDC (Direct Digital Control).

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
External reference 3	EXTREF3	PC-C1:56
Output signal	OUTP	PC-C0:36

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

Clamping of Output Signal Value

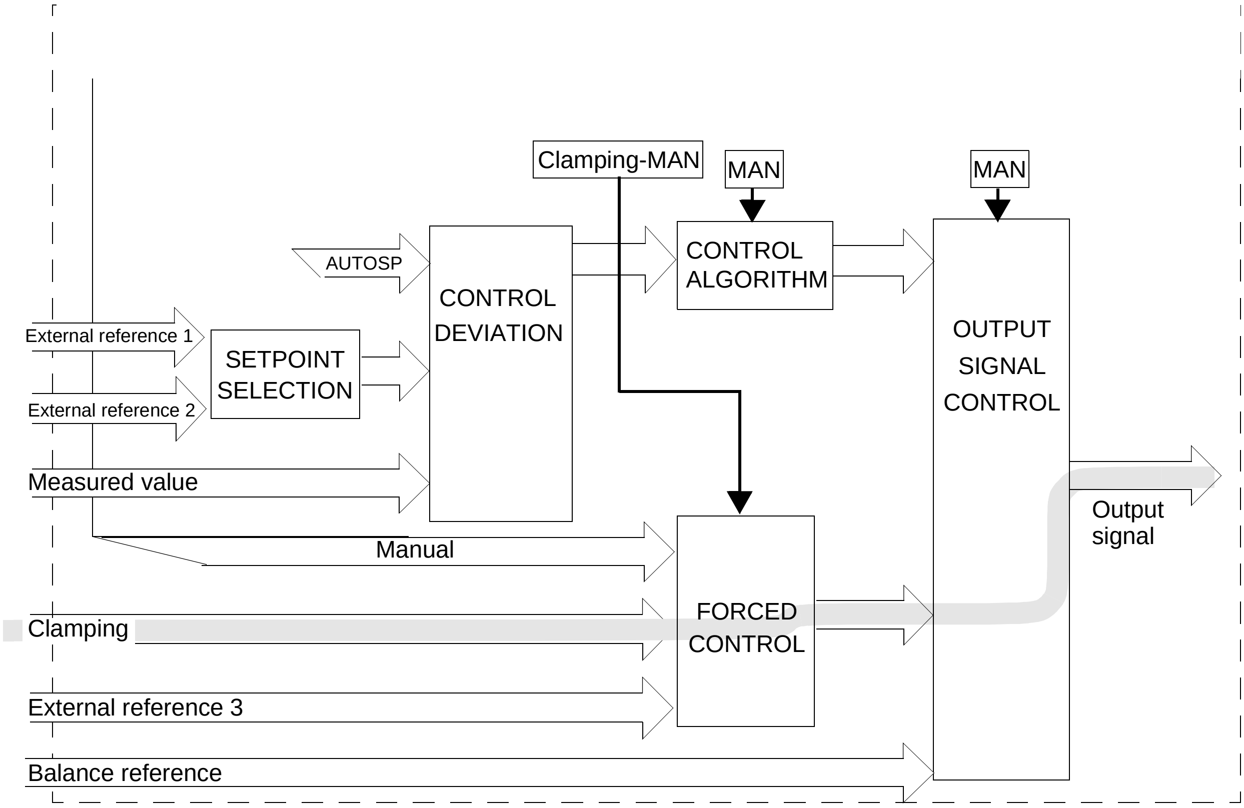


Figure 2-12. Signal path with clamping

The function obtained with clamping (CLAMP) is the same as that obtained with control mode E3 except that the priority allocated to clamping is higher. This means that the operator cannot control the output signal of the controller when it is clamped.

The clamping value consists of a signal received from an external source. The output signal is force-controlled, following a ramp function, to the clamping value. The MAN control mode returns when the clamping function is deactivated. The output signal remains at the clamping value until the operator makes a change.

NOTE

> Clamping of output signal value is used when the output signal is to go to a predetermined value when a certain event occurs.

Examples of use:

The text associated with Figure 2-1 describes an example of emergency cooling. The function with locked output signal value is used in this way.

The designations of the signals used in the description are as follows:

Designation	Abbreviation	Location [1]
Command signal for clamping	CLAMP	PC-C5:111
Clamping reference	CLAMPREF	PC-C5:112
Output signal	OUTP	PC-C0:36

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

2.3.2 Control Mode

Figure 2-13 shows the function block, MODE CONTROL. The figure includes a function table with the signals which constitute the control mode change command, release signals and signal outputs.

Control Mode Change

The signals for control mode change are placed in order of priority. LOCALFL has the highest priority and SEQE3 has the lowest priority.

The current control mode is determined by the input with the highest priority which is active or has become activated by a pulse.

The inputs are of three different types; static (STAT), set-reset (SR) and dynamic (DYN).

STAT

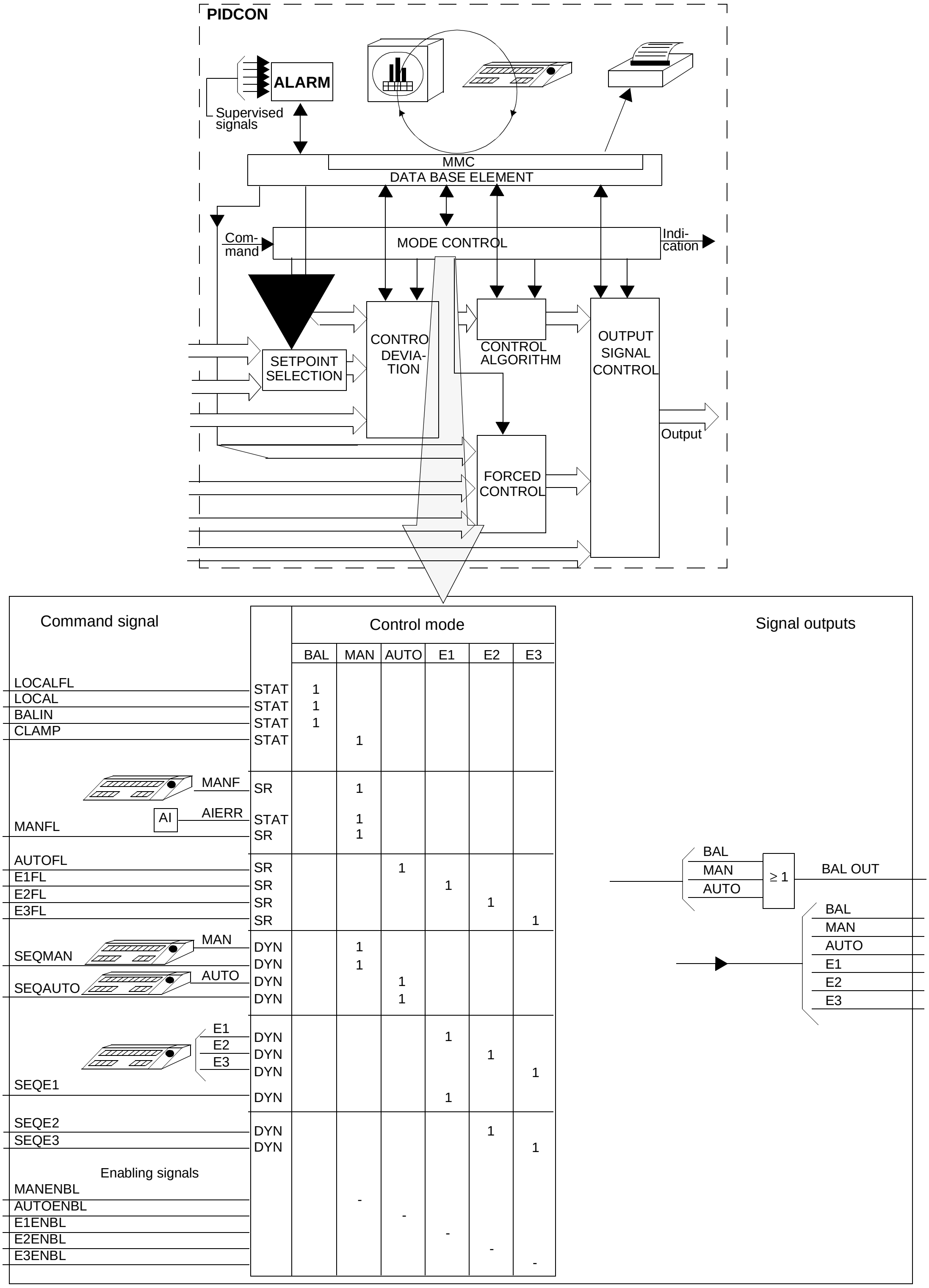
An input of static type must be activated the whole time the corresponding control mode is applied. If the signal at the input disappears, the control mode changes over to MAN, provided no static input with a lower priority takes over the selection of the control mode.

SR

Set-Reset means that the control mode is selected when the input is activated. If the input is reset to zero, the control mode remains in effect until some other input is activated. If the SR-input is kept active, only inputs with a higher priority can assume the selection of control mode.

DYN

The dynamic input is only initiating. The control mode is selected when a change from 0 to 1 occurs at the input.



Command signal		BAL	MAN	AUTO	E1	E2	E3
LOCALFL	STAT	1					
LOCAL	STAT	1					
BALIN	STAT	1					
CLAMP	STAT		1				
MANF	SR		1				
AIERR	STAT		1				
MANFL	SR		1				
AUTOFL	SR			1			
E1FL	SR				1		
E2FL	SR					1	
E3FL	SR						1
MAN	DYN		1				
SEQMAN	DYN		1				
AUTO	DYN			1			
SEQAUTO	DYN			1			
E1	DYN				1		
E2	DYN					1	
E3	DYN						1
SEQE1	DYN				1		
SEQE2	DYN					1	
SEQE3	DYN						1
MANENBL			-				
AUTOENBL				-			
E1ENBL					-		
E2ENBL						-	
E3ENBL							-

Figure 2-13. MODE CONTROL function

BAL

Control mode BAL is commanded by:

Abbreviation	Location [1]	Description
LOCALFL	PC-C3:81	Indication BAL LOCAL on the display screen. The change is presented in the event list.
LOCAL	PC-C3:82	Indication BAL LOCAL on the display screen.
BALIN	PC-C3:83	Indication BAL on the display screen.

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

MAN

The control mode MAN is commanded by:

Abbreviation	Location [1]	Description
CLAMP	PC-C5:111	Indication MAN CLAMP on the display screen.
MANF MAN		Changeover to control mode forced MAN from the operator’s keyboard. Indication FORCED on the display screen.
AIERR		ERROR-initiation of the control mode MAN (see below).
MANFL	PC-C3:84	The changeover is presented in the event list.
MAN		Changeover from the operator’s keyboard.
SEQMAN	PC-C3:86	

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

ERROR Initiation of Control Mode MAN

When certain faults occur, a signal AIERR is activated from the analog input AI.

Examples of such errors include:

- Loss of current signal
- Overflow
- Board fault (Diagnostics)
- A/D converter fault

Information regarding the quality of the measured value is obtained from the AI and is copied to the controller for automatic processing of the error and for presentation. The AI concerned is pointed out at the population of the data base element for PIDCON (DB-S1/121.240).

When AI ERR is activated, the control mode of the controller changes over to MAN and the output signal is frozen at its value when the error signal was activated. It is then possible to control the output signal manually.

When the fault (AIERR) disappears, all of the indications are reset to zero. The controller remains however in the control mode MAN until another control mode is requested automatically or by the operator.

AUTO

Control mode AUTO is commanded by:

Abbreviation	Location [1]	Description
AUTOFL	PC-C3:85	The change is presented in the event list.
AUTO		From the operator's keyboard.
SEQAUTO	PC-C3:87	

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

E1

Control mode E1 is commanded by:

Abbreviation	Location [1]	Description
E1FL	PC-C2:71	The change is presented in the event list.
E1		Change from the operator’s keyboard
SEQE1	PC-C2:74	

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

E2

Control mode E2 is commanded by:

Abbreviation	**Location** [1]	**Description**
E2FL	PC-C2:72	The change is presented in the event list.
E2		Change from the operator's keyboard.
SEQE2	PC-C2:75	

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 2-3.

E3

Control mode E3 is commanded by:

Abbreviation	**Location** [1]	**Description**
E3FL	PC-C2:73	The change is presented in the event list.
E3		Change from the operator's keyboard.
SEQE3	PC-C2:76	

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 2-3.

Release Signals

The release signals provide the possibility of permitting (.... ENBL set to 1) or preventing control mode change from the operator's keyboard.

The signals apply for the following control modes:

Abbreviation	**Location** [1]	**Description**
MANENBL	PC-C0:27	Control mode MAN
AUTOENBL	PC-C0:28	Control mode AUTO
E1ENBL	PC-C1:51	Control mode E1
E2ENBL	PC-C1:52	Control mode E2
E3ENBL	PC-C1:53	Control mode E3

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 2-3.

Signal Outputs

Abbreviation	**Location** [1]	**Description**
BALOUT	PC-C1:62	Are activated when BAL, MAN or AUTO apply. Used, for example, with cascade control to balance the previous controllers.
BAL	PC-C0:37	Activated when the control mode is BAL
MAN	PC-C0:38	Activated when the control mode is MAN
AUTO	PC-C0:39	Activated when the control mode is AUTO
E1	PC-C1:59	Activated when the control mode is E1
E2	PC-C1:60	Activated when the control mode is E2
E3	PC-C1:61	Activated when the control mode is E3

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

The signals BAL, MAN, AUTO, E1, E2 and E3 can be used for control of other PC elements or for external functions, indications etc.

2.3.3 Control Algorithm

The algorithm consists of a controller with optional P-, PI-, PD- or PID-characteristics.
The different parameters can be determined both from the operator’s keyboard and from a PC connection. This creates possibilities of adaptive control with, for example, higher gain with large deviation between setpoint and measured value.

The derivation can be performed either on the controllers measured value or on the control deviation.

Direct or reversed control effect is selected via the PC programming.

Anti Reset Wind Up is performed when the output signal of the controller is limited or when the controller controls from a direction other than from the block CONTROL ALGORITHM. The I-part of the controller is controlled then to a value such that the sum of the P- and I-parts assumes the limited value. Bump in the output signal is hereby avoided when the limiting ceases or when the control mode is changed.

Figure 2-14 shows the contents of the function block.

Signal Descriptions

Abbreviation	**Location** [1]	**Description**
TD	PC-C6:126	External derivation time constant TD.
ETDE	PC-C6:125	Exchange signal between the operator's keyboard (0) and external signal input (1) for TD.
TF	PC-C6:128	External filter time constant TF.
ETFE	PC-C6:127	Exchange signal between the operator's keyboard (0) and external signal input (1) for TF.
EDERBLK	PC-C6:132	External derivation blocking/resetting to zero (1).
EDERBE	PC-C6:131	Exchange signal between the operator's keyboard (0) and external signal input (1) for derivation- blocking/ resetting to zero.
DERIV	PC-C0:F5	Exchange signal between measured value (0) and control deviation (1) for derivation.
REVACT	PC-C0:F4	Reversed action (1) (increasing measured value then gives decreasing output signal). Direct action (0).
TI	PC-C6:124	External integration time constant TI.
ETIE	PC-C6:123	Exchange signal between the operator's keyboard (0) and external signal input (1) for TI.
EINTBLK	PC-C6:130	External integration blocking/resetting to zero (1).
EINTBE	PC-C6:129	Exchange signal between the operator's keyboard (0) and external signal input (1) for integration- blocking/ resetting to zero.
GAIN	PC-C6:122	External gain factor GAIN.
EGAINE	PC-C6:121	Exchange signal between the operator's keyboard (0) and external signal input for GAIN (1).

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 2-3.

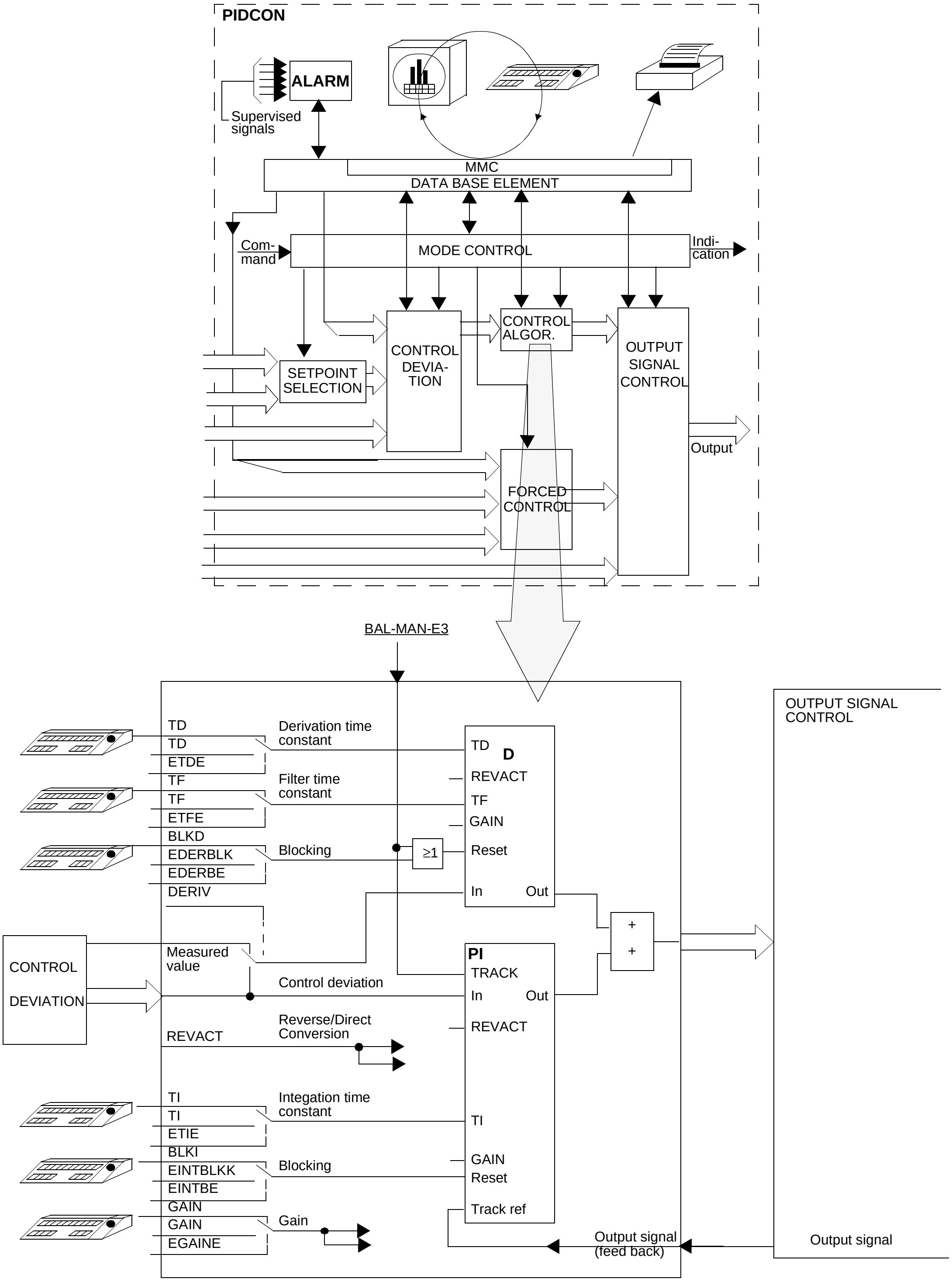


Figure 2-14. Function block CONTROL ALGORITHM

Function Block PI and D

The transfer function for a PID controller consists of the sum of the different transfer functions for PI-controller and derivator.

$$G(s) \ = \ GAIN(1 + \frac{1}{s \cdot T1} + \frac{s \cdot TD}{1 + s \cdot TF})$$

GAIN = gain constant

TI = integration time constant

TD = derivation time constant

TF = filter time constant.

The PID algorithm in the software performs the following tests:

If $\frac{TS}{TI} > 1$, $\frac{TS}{TI}$ is set = 1

TD and TF 2 x TS, otherwise TD and TF are set = 2 x TS

TS = the sampling time for the controller.

Tracking Function

The derivation function is reset to zero with the control modes BAL, MAN and E3. The integration function goes over to the tracking mode. The output signal from OUTPUT SIGNAL CONTROL functions as a TRACK REF.

This function eliminates abrupt output signal changes to a control mode other than BAL, MAN and E3.

2.3.4 Ramp Function

Ramp functions are introduced into the signal paths to determine the maximum permitted rate of change of certain signals. These are designated RAMP and are located in the function blocks, CONTROL DEVIATION, SETPOINT SELECTION and FORCED CONTROL.

The maximum permitted rate of change is determined by the operational parameter SPEED (X) and is specified in process-related variables/second or percentage units/second, depending on the signal.

2.3.5 Control Deviation

This block contains the following main functions:

- Selection of working setpoint
- Calculation of control deviation
- Conversion to percentage units

In addition to the calculation of the control deviation there are three further functions:

- Tracking of AUTO setpoint
- Ramp function for AUTO setpoint
- Limitation of AUTO setpoint

Selection of Working Setpoint

The setpoint which is to be compared with the measured value for calculation of control deviation is designated the working setpoint. This can be either the AUTO setpoint from the operator's keyboard (control mode AUTO) or an external reference from SETPOINT SELECTION (control modes E1, E2).

Calculation of Control Deviation

The control deviation is calculated with the following equation:

DEV = MV - WSP

DEV = control deviation

MV = measured value

WSP = working setpoint

Tracking of AUTO-setpoint

Two tracking functions are included for the AUTO-setpoint (AUTOSP). The tracking functions can be activated with other control modes than AUTO. Their purpose is to permit bumpless connection of the AUTO-setpoint or connection with constant signal value.

The function is selected with two parameters, TRACKA and TRACKB. The relation between tracking references, control modes, and parameters is shown in Section 2.4 PC Element PIDCON.

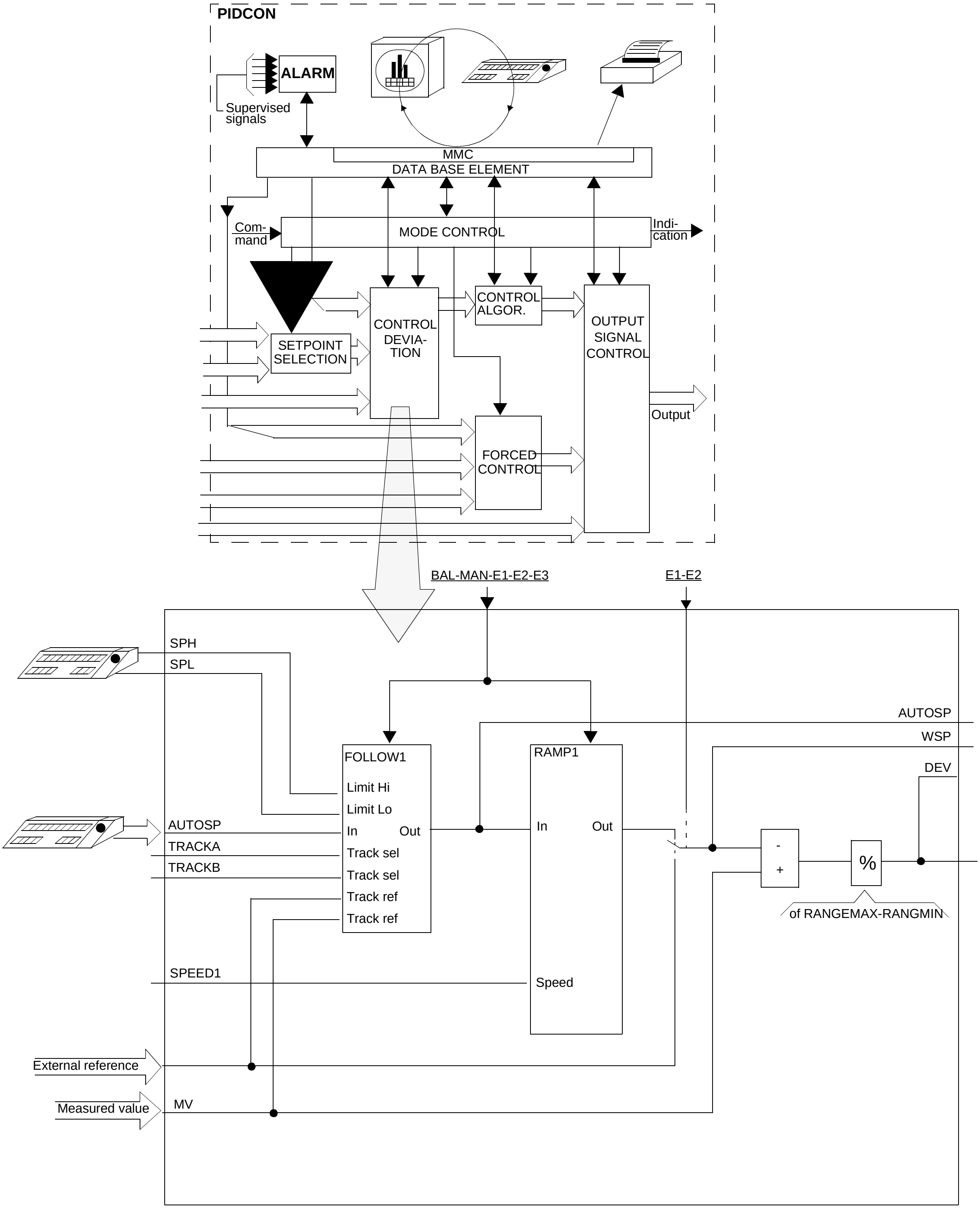


Figure 2-15. Function block CONTROL DEVIATION

With bumpless switch-over, the control deviation is to be zero at the moment of connection. The working setpoint (WSP) will be changed to the operator-entered setpoint (AUTOSP) with the ramp in accordance with SPEED1.

With switch-over without change of setpoint (AUTOSP), the control deviation is to be zero at the moment of connection. The working setpoint (WSP) will not be changed. The operator-entered setpoint (AUTOSP) has, instead, followed the track reference (WSP or MV).

Ramp Function for AUTO-setpoint

A ramp is provided to determine the highest permitted rate of change of the AUTO-setpoint. The operational parameter for RAMP 1 is SPEED1.

Limitation of AUTO-setpoint

The setpoint can be allocated an upper (SPH) and a lower (SPL) limiting value from the operator's keyboard. The limiting values can be set the same but not crossed. The application of a limitation is indicated.

Signal Descriptions

Abbreviation	**Location** [1]	**Description**
TRACKA	PC-C0:F1	Function parameter for tracking
TRACKB	PC-C0:F2	Function parameter for tracking
SPEED1	PC-C0:25	Highest permitted rate of change
MV	PC-C0:24	Measured value
AUTOSP	PC-C0:33	AUTO setpoint
WSP	PC-C0:34	Working setpoint
DEV	PC-C0:35	Control deviation

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

2.3.6 Setpoint Selection

SETPOINT SELECTION contains the following functions:

- Selection of external reference (1 or 2)
- Tracking
- Ramp functions
- Limitations

Selection of External Reference

The working setpoint from SETPOINT SELECTION is external reference 1 (control mode E1) or external reference 2 (control mode E2).

Tracking

Two tracking functions below are integrated:

1. External reference 1 can follow the working setpoint with a control mode other than E1. This takes place in FOLLOW 2.
2. External reference 2 can follow the working setpoint with a control mode other than E2. This takes place in FOLLOW 3.

The selected external reference is accessed from CONTROL DEVIATION.

The tracking functions are intended to eliminate abrupt changes of the setpoint on return to the control modes E1 and E2 respectively. The tracking functions are controlled with a function parameter (TRACKC). The relation between control modes and function parameters is shown in Section 2.4 PC Element PIDCON.

Ramp Functions

Two ramp functions are provided to determine the highest permitted rates of change of the two external references. Operation parameters for the ramp function are SPEED2 (RAMP 2) and SPEED3 (RAMP 3).

Limitations

The same limiting values (SPH and SPL) selected for the AUTO setpoint (see CONTROL DEVIATION) also apply for both the external references. The application of a limitation is indicated.

Signal Descriptions

Abbreviation	**Location** [1]	**Description**
EXTREF1	PC-C1:54	External reference 1
SPEED2	PC-C1:57	Highest permitted rate of change
TRACKC	PC-C0:F3	Function parameters for following
EXTREF2	PC-C1:55	External reference 2
SPEED3	PC-C1:58	Highest permitted rate of change

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

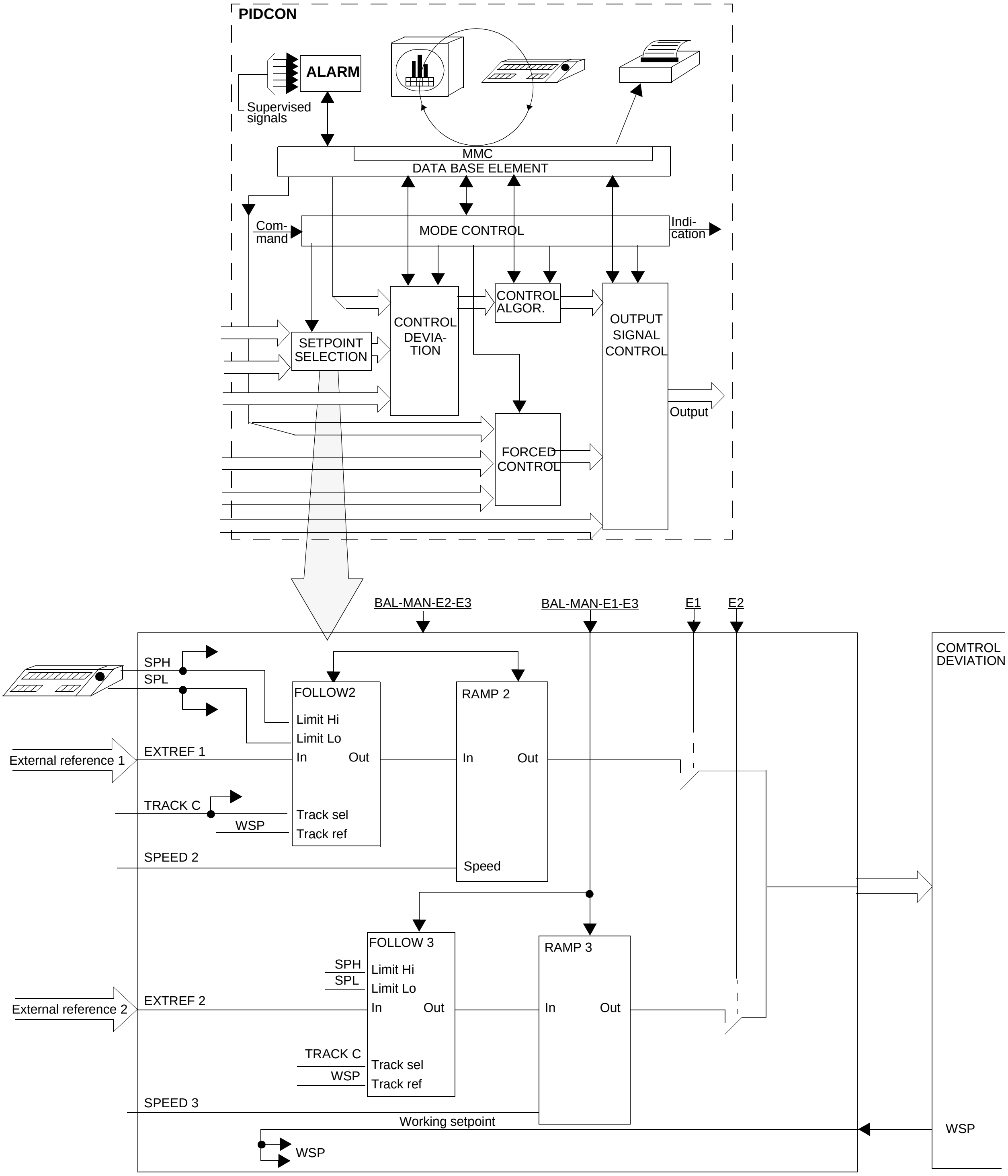


Figure 2-16. Function block SETPOINT SELECTION

2.3.7 Forced Control

The function block contains the following functions:

- Selection of control signal
- Tracking
- Ramp functions
- Limitations

Selection of Control Signal

There are three direct-controlling signals:

- Manual is selected with the control mode MAN
- External references are selected with the control mode E3
- Clamping is selected with the clamping function (control mode MAN)

Tracking

Tracking functions are integrated to eliminate abrupt output signal changes at change-over to and from the control modes MAN, MAN CL(amped) and E3.

Signal Descriptions

Abbreviation	Location [1]	Description
SPEED4	PC-C0:26	Highest permitted rate of change
CLAMPREF	PC-C5:112	Clamping value. See the note in this section
EXTREF3	PC-C1:56	External reference
CLAMP	PC-C5:111	See the note in this section

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

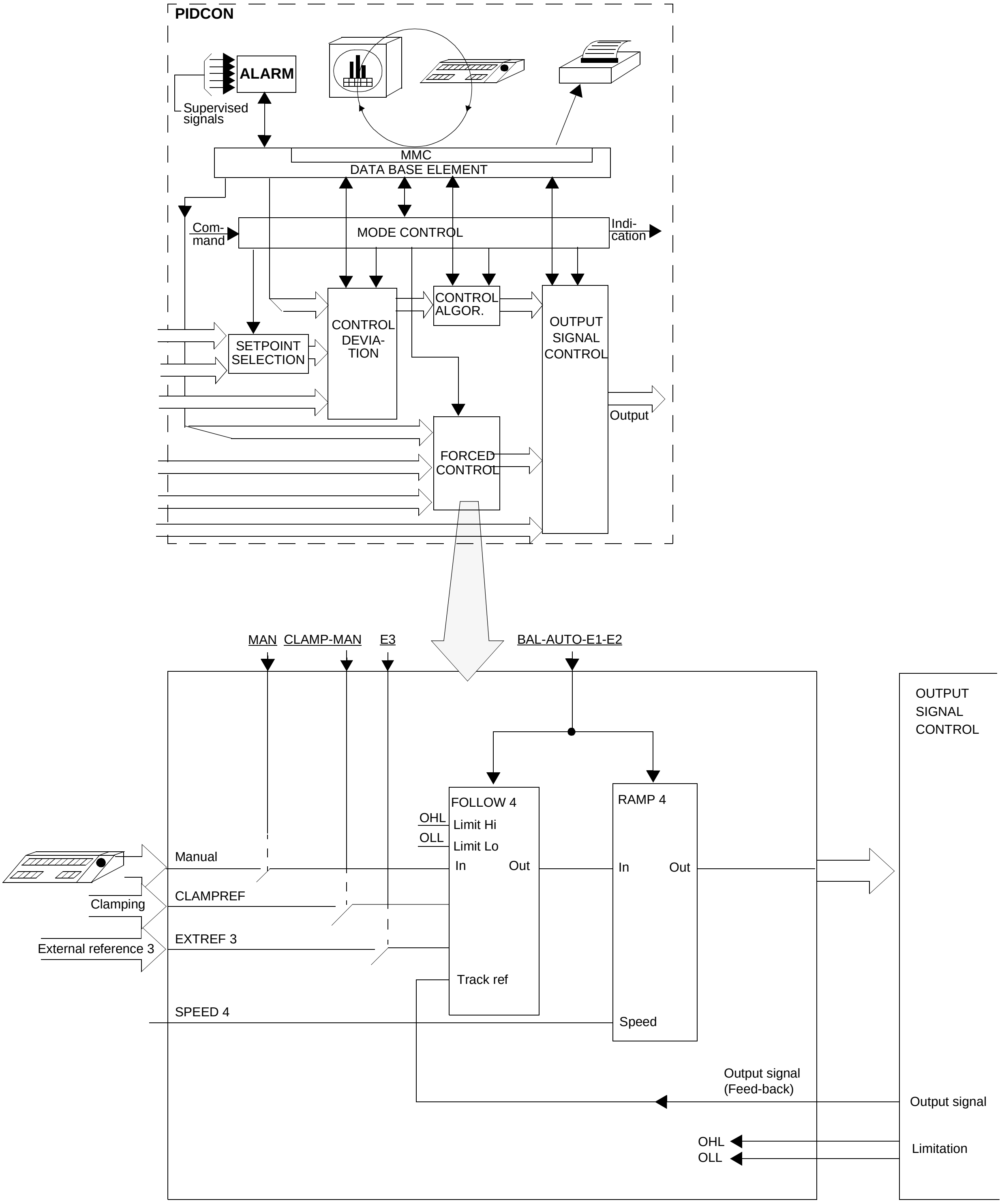


Figure 2-17. Function block FORCED CONTROL

Ramp Function

A ramp function is provided to permit determination of the highest permitted rate of change of the three control signals. The ramp time is set in %/s with an operation parameter, SPEED4.

Limitations

The control signals can be allocated an upper (OHL) and a lower (OLL) limit value from the operator’s keyboard.

The limiting values can be set equal but not crossed. The application of a limitation is indicated.

NOTE

> The clamping function is activated by the signal CLAMP.
> The reference value for the output signal is CLAMPREF.
> The control mode becomes MAN CL when CLAMP is active.

2.3.8 Output Signal Control

The following takes place in the block OUTPUT SIGNAL CONTROL:

- Selection of output signal
- Output signal limitation

Selection of Output Signal

The output signal is selected in accordance with the control mode as follows:

AUTO, E1, E2	A control signal from CONTROL ALGORITHM
MAN, MAN CL(amped), E3	A control signal from FORCED CONTROL
BAL	The control signal Balance reference

Output Signal Limitation

The amplitude of the output signal can be limited in the function block MIN-MAX.

The limitations consist of an upper limit (OHL) and a lower limitation (OLL).

The limiting values can be determined either from the operator's keyboard or externally (from another PC element or external device). The exchange is performed with signal EOLIM.

The operator-entered limiting values are not affected when external limits are used.

The limiting values currently active are presented on the display screen. The application of a limitation is indicated on the display screen and on PC connections.

The limiting values from the operator can be set equal but cannot be crossed.

If the external limiting values cross (EOLL > EOHL) only the upper value (EOHL) applies. The output signal can thereby be force controlled to the value for EOHL. The crossing of the limiting values causes a fault indication (OLIMERR).

Signal Descriptions

Abbreviation	**Location** [1]	**Description**
BALREF	PC-C3:88	Balance reference
EOHL	PC-C5:115	Upper external limiting value
EOLL	PC-C5:114	Lower external limiting value
EOLIM	PC-C5:113	Signal for selection of external limitation
OUTP	PC-C0:36	Output signal
OLIMERR	PC-C5:117	Crossed external limiting value.

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

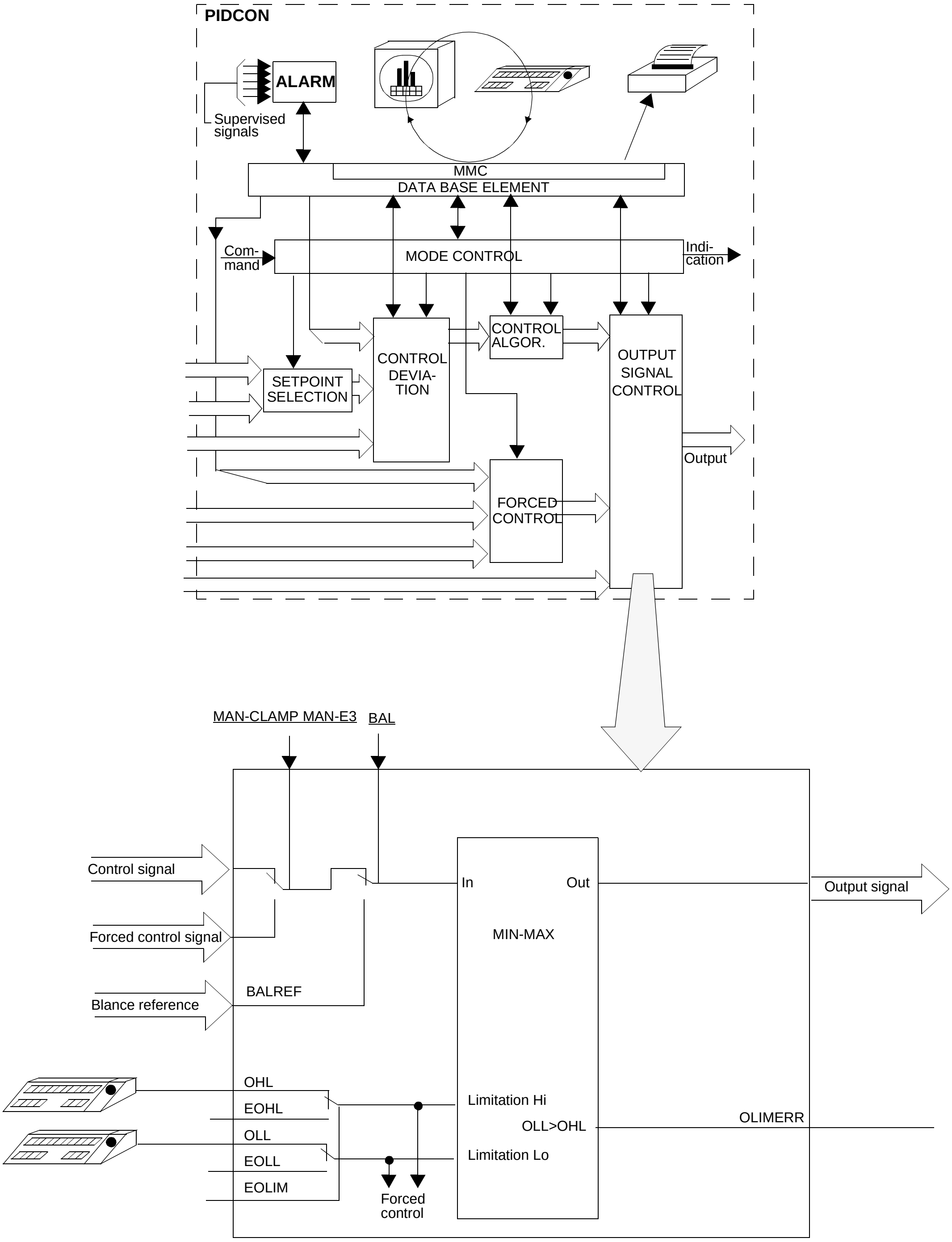


Figure 2-18. Function block OUTPUT SIGNAL CONTROL

2.3.9 Scaling and Units

The process controller works internally with process-related units up to the calculation of the control deviation when there is a changeover to percentage units. This means that measured values and setpoints, both internal and external are specified in process-related units and other signals in percentage units.

The deviation is expressed in percent of the measured value range (MAX-MIN). See Section 2.5 Data Base Element PIDCON

The PI-block and the D-block (CONTROL ALGORITHM) and MIN-MAX (OUTPUT SIGNAL CONTROL) all work in the range -100% to +100%. "Over-range" is possible.

The output signal (OUTP) adopts values in the interval -100% to +100%. "Over-range" is possible except in the Operator Station bargraph which shows 0 - 100%.

2.3.10 Alarm and Limitation Functions

The function block ALARM monitors the following signals:

Measured value	MV	with two upper and two lower alarm limits
Control deviation	DEV	with one upper and one lower alarm limit
Auto setpoint	AUTOSP	
External reference	EXTREF	with one upper and one lower limitation
Output signal	OUTP	

When an alarm limit is exceeded, an alarm which must be acknowledged is transmitted to the display screen (and printer, if provided). Alarms are also available as outputs on the PC element. The status of the limitation is handled in a similar way (except acknowledgement requirement, alarm color and acoustic signal).

Alarm Limits

When determining the alarm limits, the following applies:

$$H2 \geq H1 \geq L1 \geq L2$$

If an attempt is made to cross the alarm limits with each other, the operator is notified that the operation is not permitted. There is no change of the limit.

Alarm Blocking

All supervision of the measured value (MV) and control deviation (DEV) can be blocked by activating the connection ALCBLK. Automatic alarm blocking can be suitable in connection with start and stop and with anticipated events, so-called sequential fault blocking. The signal outputs are also affected by this blocking (as distinct from operator's blockings which only block display screen and printer).

The event handling function makes it possible to block alarms for error type 1 and 2 from the operator's station or from PC via the data base element.

Type 1 error include:	MV ≥ H1
	MV ≤ L1
	DEV ≥ H1
	DEV ≤ L1
Type 2 error embraces:	MV ≥ H2
	MV ≤ L2

This form of alarm blocking means that the printer and display screen and updating of the error list are blocked. The PC outputs are not affected.

Signal Description

Abbreviation	**Location** [1]	**Description**
ALCBLK	PC-C4:102	Blocking of alarm on MV and DEV
MV_GT_H2	PC-C4:108	Measured value exceeds H2
MV_GT_H1	PC-C4:107	Measured value exceeds H1
MV_LT_L1	PC-C4:106	Measured value less than L1
MV_LT_L2	PC-C4:105	Measured value less than L2
DEV_GT_H	PC-C4:110	Deviation exceeds H1
DEV_LT_L	PC-C4:109	Deviation less than L1
SP=HL	PC-C4:104	Setpoint limit, high
SP=LL	PC-C4:103	Setpoint limit, low
OUT=HL	PC-C0:41	Output signal limit, high
OUT=LL	PC-C0:40	Output signal limit low

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 2-3.

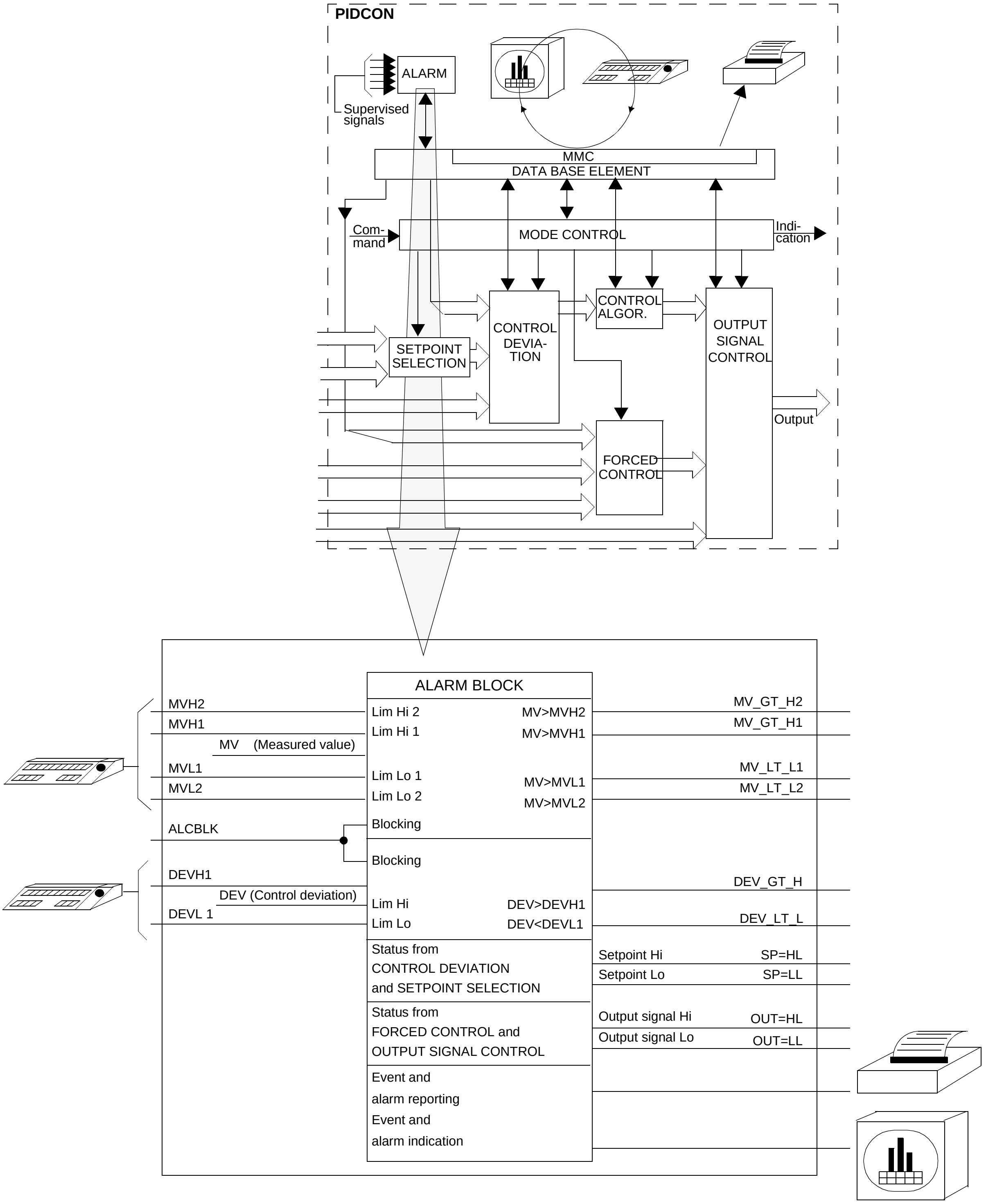


Figure 2-19. Function block ALARM

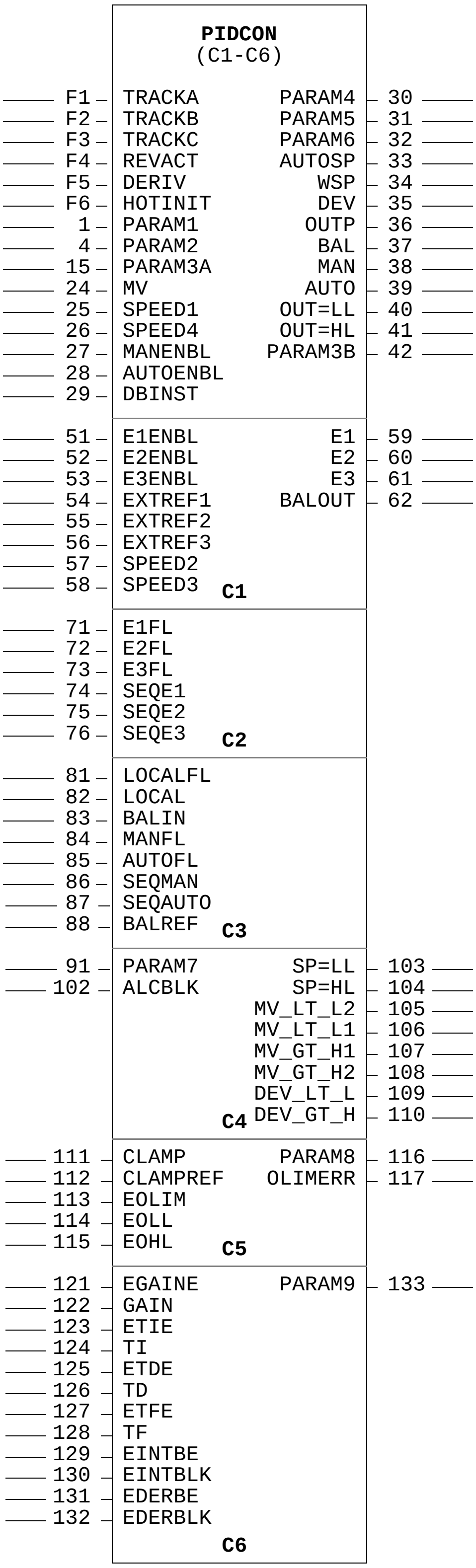
2.4 PC Element PIDCON

The information about the PC element in the functional unit PIDCON, its extension with call parameters and its connection description are given mainly in data sheet form. This data sheet is included in the manual *PC Elements Advant Controller 400 Series Reference Manual* in which all of the PC-elements included in the Advant Controller 410/450 products are assembled.

Process Controller PIDCON

Summary

The PC element PIDCON forms part of the functional unit PIDCON (**PID CON**troller). The unit is a flexible and powerful process controller with standardized operator functions. It is used in traditional instrumentation when a VDU based operator station is specified.



Call PIDCON (C1, C2, C3, C4, C5, C6)

The element consists of one basic part that gives a regulator function in its basic form. This part may be extended with optional functions which are selected using call parameters C1–C6, see table below.

Parameter	Significance	Permissible values
C1	Ordering of operation mode E1, E2 or E3.	0 .. 1
C2	Ordering of operation mode via PC connection.	0 .. 1
C3	Ordering of operation mode via PC connection.	0 .. 1
C4	Set point value limitation and alarm limits	0 .. 1
C5	Output signal control.	0 .. 1
C6	Setting of control parameters via PC connection.	0 .. 1

Terminal Description

No	Name	Type	Description
F1	TRACKA	II	**TRACK**ing **A**. Function parameter for tracking A.
F2	TRACKB	II	**TRACK**ing **B**. Function parameter for tracking B.
F3	TRACKC	II	**TRACK**ing **C**. Function parameter for tracking C.
F4	REVACT	II	**REV**erse **ACT**ion. Function parameter for control action. Reverse action means that the output signal decreases with increasing measured value. Direct action means that the output signal increases with increasing measured value.
F5	DERIV	II	**DERIV**ation. Function parameter for selection of whether D action is performed on the measured value (MV) or on the deviation (DEV). F5=0 yields D action on the measured value (MV). F5=1 yields D action on the deviation (DEV).
F6	HOTINIT	II	**HOT INIT**. Function parameter for warm start.
1	PARAM1	II	**PARAM**eter **1**. Connection to the data base element (PARAM1).
4	PARAM2	IA48	**PARAM**eter **2**. Connection to the data base element (PARAM2).
15	PARAM3A	II	**PARAM**eter **3 A**. Connection to the data base element (PARAM3).
24	MV	IR	**M**easured **V**alue. Input for measured value.
25	SPEED1	IR	Input for the largest change rate for the set point in AUTO mode (engineering unit/second).
26	SPEED4	IR	Input for the largest change rate for the output in MAN mode. (percent/second).
27	MANENBL	IB	**MAN**ual **EN**a**BL**e. Input for enabling ordering of operation mode MAN by the operator. 0=MAN may not be ordered by the operator. 1=MAN may be ordered by the operator.
28	AUTOENBL	IB	**AUTO EN**a**BL**e. Input for enabling ordering of operation mode AUTO by the operator. 0=AUTO may not be ordered by the operator. 1=AUTO may be ordered by the operator.
29	DBINST	II	**D**ata **B**ase **INST**ance. An operational parameter or a constant, defining the instance number of the data base (to be found in its header). Alternatively, a connection to the data base element.
30	PARAM4	OI	**PARAM**eter **4**. Connection to the data base element (PARAM4).
31	PARAM5	OIL	**PARAM**eter **5**. Connection to the data base element (PARAM5)

Terminal Description

No	Name	Type	Description
32	PARAM6	OA32	**PARAM**eter **6**. Connection to the data base element (PARAM6).
33	AUTOSP	OR	**AUTO S**et **P**oint. Output for set point in operation mode AUTO.
34	WSP	OR	**W**orking **S**et **P**oint. Output for working set point.
35	DEV	OR	**DEV**iation. Output for control deviation.
36	OUTP	OR	**OUT**put. Output signal of the controller, the manipulated variable.
37	BAL	OB	**BAL**ance. Output for operation mode indication. This output is set to 1 with operation mode BAL.
38	MAN	OB	**MAN**ual. Output for operation mode indication. This output is set to 1 with operation mode MAN.
39	AUTO	OB	**AUTO**. Output for operation mode indication. This output is set to 1 with operation mode AUTO.
40	OUT=LL	OB	**OUT**put**=L**ow **L**imit. Output for indication of output signal limitation. It is set to 1 when the output signal equals the lower limit value.
41	OUT=HL	OB	**OUT**put**=H**igh **L**imit. Output for indication of output signal limitation. It is set to 1 when the output signal equals the upper limit value.
42	PARAM3B	OI	**PARAM**eter **3B**. Connection to the data base element (PARAM3). Acknowledgement of switching of operation mode by the operator.
51(1)	E1ENBL	IB	**E1 EN**a**BL**e. Input for enabling ordering of operation mode E1 by the operator. 0=E1 may not be ordered by the operator. 1=E1 may be ordered by the operator.
52(1)	E2ENBL	IB	**E2 EN**a**BL**e. Input for enabling ordering of operation mode E2 by the operator. 0=E2 may not be ordered by the operator. 1=E2 may be ordered by the operator.
53(1)	E3ENBL	IB	**E3 EN**a**BL**e. Input for enabling ordering of operation mode E3 by the operator. 0=E3 may not be ordered by the operator. 1=E3 may be ordered by the operator.
54(1)	EXTREF1	IR	**EXT**ernal **REF**erence **1**. Input for external reference (setpoint) in operation mode E1.
55(1)	EXTREF2	IR	**EXT**ernal **REF**erence **2**. Input for external reference (setpoint) in operation mode E2.
56(1)	EXTREF3	IR	**EXT**ernal **REF**erence **3**. Input for external reference for the output OUT, in operation mode E3.
57(1)	SPEED2	IR	Input for the maximum change rate for the setpoint in mode E1 (engineering unit/second).
58(1)	SPEED3	IR	Input for the maximum change rate for the setpoint in mode E2 (engineering unit/second).
59(1)	E1	OB	Output for operation mode indication. This output is set to 1 with operation mode E1.
60(1)	E2	OB	Output for operation mode indication. This output is set to 1 with operation mode E2.
61(1)	E3	OB	Output for operation mode indication. This output is set to 1 with operation mode E3.
62(1)	BALOUT	OB	**BAL**ance **OUT**. Output for operation mode indication. This output is set to 1 with operation modes BAL, MAN and AUTO.
71(2)	E1FL	IB	**E1 FL**ash. Input for ordering of operation mode E1. It also gives an event report.
72(2)	E2FL	IB	**E2 FL**ash. Input for ordering of operation mode E2. It also gives an event report.

Terminal Description

No	Name	Type	Description
73(2)[2]	E3FL	IB	**E3 FL**ash. Input for ordering of operation mode E3. It also gives an event report.
74(2)[2]	SEQE1	IB	**SEQ**uential **E1**. Pulse input for ordering of operation mode E1.
75(2)[2]	SEQE2	IB	**SEQ**uential **E2**. Pulse input for ordering of operation mode E2.
76(2)[2]	SEQE3	IB	**SEQ**uential **E3**. Pulse input for ordering of operation mode E3.
81(3)	LOCALFL	IB	**LOCAL FL**ash. Input for ordering of operation mode BAL. It gives an event report and VDU indication BAL LOCAL.
82(3)	LOCAL	IB	**LOCAL**. Input for ordering of operation mode BAL. It gives VDU indication BAL LOCAL.
83(3)[3]	BALIN	IB	**BAL**ance **IN**put. Input for ordering of operation mode BAL.
84(3)	MANFL	IB	**MAN**ual **FL**ash. Input for ordering of operation mode MAN. It gives an event report.
85(3)	AUTOFL	IB	**AUTO FL**ash. Input for ordering of operation mode AUTO. It gives an event report.
86(3)	SEQMAN	IB	**SEQ**uential **MAN**ual. Pulse input for ordering of operation mode MAN.
87(3)	SEQAUTO	IB	**SEQ**uential **AUTO**. Pulse input for ordering of operation mode AUTO.
88(3)	BALREF	IR	**BAL**ance **REF**erence. Input for reference value with operation mode BAL.
91(4)	PARAM7	IA48	**PARAM**eter **7**. Connection to the data base element (PARAM7).
102(4)	ALCBLK	IB	**AL**arm **C**ontrol **BL**oc**K**. Input which, when set to 1, blocks limit value alarms for MV and DEV.
103(4)	SP=LL	OB	**S**et **P**oint=**L**ow **L**imit. Output set to 1 when the set point equals the lower limit value.
104(4)	SP=HL	OB	**S**et **P**oint=**H**igh **L**imit. Output set to 1 when the set point equals the upper limit value.
105(4)	MV_LT_L2	OB	**M**easured **V**alue**_LT_L**ow **2**. Output set to 1 when the measured value (MV) falls below alarm limit L2.
106(4)	MV_LT_L1	OB	**M**easured **V**alue**_LT_L**ow **1**. Output set to 1 when the measured value (MV) falls below alarm limit L1.
107(4)	MV_GT_H1	OB	**M**easured **V**alue**_GT_H**igh **1**. Outputset to 1 when the measured value exceeds alarm limit H1.
108(4)	MV_GT_H2	OB	**M**easured **V**alue**_GT_H**igh **2**. Output set to 1 when the measured value exceeds alarm limit H2.
109(4)	DEV_LT_L	OB	**DEV**iation**_LT_L**ow. Output set to 1 when the deviation (DEV) falls below the low alarm limit (L).
110(4)	DEV_GT_H	OB	**DEV**iation**_LT_H**igh. Output set to 1 when the deviation (DEV) exceeds the high alarm limit (H).
111(5)	CLAMP	IB	Input for ordering of operation mode MAN with clamping.
112(5)	CLAMPREF	IR	**CLAMP REF**erence. Clamp value with operation mode MAN with clamping.
113(5)	EOLIM	IB	**E**xternal **O**utput **LIM**it. Change signal for output signal limits. 0=from the operator's keyboard. 1=from the inputs EOLL and EOHL.
114(5)	EOLL	IR	**E**xternal **O**utput **L**ow **L**imit. Input for lower limit for the output signal.
115(5)	EOHL	IR	**E**xternal **O**utput **H**igh **L**imit. Input for upper limit for the output signal.
116(5)	PARAM8	OA8	**PARAM**eter **8**. Connection to the data base element (PARAM8).

Terminal Description

No	Name	Type	Description
117(5)	OLIMERR	OB	**O**utput **LIM**it **ERR**or. Output which, when set to 1, indicates an error in the alarm limits, i.e. EOLL>EOHL.
121(6)	EGAINE	IB	**E**xternal **GAIN E**nable. Input for selection of GAIN. 0=from the operator's keyboard. 1=from the external signal input GAIN.
122(6)	GAIN	IR	Input for GAIN.
123(6)	ETIE	IB	**E**xternal **TI E**nable. Input for selection of integration time constant. 0=from the operator's keyboard 1=from the external signal input TI
124(6)	TI	ITR	**T**ime **I**ntegration. Input for integration time constant.
125(6)	ETDE	IB	**E**xternal **TD E**nable. Input for selection of derivation time constant. 0=from the operator's keyboard 1=from the external signal input TD
126(6)	TD	ITR	**T**ime **D**erivation. Input for derivation time constant.
127(6)	ETFE	IB	**E**xternal **TF E**nable. Input for selection of filter time constant. 0=from the operator's keyboard 1=from the external signal input TF
128(6)	TF	ITR	**T**ime **F**ilter. Input for the filter time constant for the derivation function.
129(6)	EINTBE	IB	**E**xternal **INT**egration **B**locking **E**nable. Input for selection of blocking signal for integration. 0=Blocking is done from the operator's keyboard. 1=Blocking is done using the signal EINTBLK.
130(6)	EINTBLK	IB	**E**xternal **INT**egration **B**loc**K**ing. Input for blocking and clearing of the integration function.
131(6)	EDERBE	IB	**E**xternal **DER**ivation **B**locking **E**nable. Input for selection of blocking signal for derivation. 0=Blocking is done from the operator's keyboard 1=Blocking is done using the signal EDERBLK.
132(6)	EDERBLK	IB	**E**xternal **DER**ivation **BL**oc**K**ing. Input for blocking and clearing of the derivation function.
133(6)	PARAM9	OA16	**PARAM**eter **9**. Connection to the data base element (PARAM9).

(1) Available only if C1=1.
(2) Available only if C2=1.
(3) Available only if C3=1.
(4) Available only if C4=1.
(5) Available only if C5=1.
(6) Available only if C6=1.

Selection of parameters for the tracking function of AUTOSP

TRACKA	**TRACKB**	**Description**
0	0	No tracking
1	1	AUTOSP is not affected. Changeover to AUTO takes place bumplessly by the working setpoint, WSP, taking on the measured value, MV. Thereafter WSP is ramped to equal AUTOSP with a speed that is determined by SPEED1. ”Tracking” takes place in the operating modes BAL, MAN, E1, E2 and E3.
2	1	AUTOSP is not affected. Changeover to AUTO takes place bumplessly by the working setpoint, WSP, taking on the value of EXTREF1 or EXTREF2, depending on whether operating mode E1 or E2 applies. Thereafter WSP is ramped to equal AUTSP with a speed that is determined by SPEED1. ”Tracking ”takes place in the operating modes E1 and E2.
1	2	AUTOSP tracks the measured value, MV. Changeover to AUTO takes place both without bumps and changes by the working setpoint, WSP, taking on the measured value, MV. Tracking takes place in the operating modes BAL, MAN, E1, E2 and E3.
2	2	AUTOSP tracks the external setpoint EXTREF1 or EXTREF2, depending on whether operating mode E1 or E2 applies. Changeover to AUTO takes place both without bumps and changes by the working setpoint, WSP, taking on the value of the external reference EXTREF1 or EXTREF2 as applicable. Tracking takes place in the operating modes E1 and E2.

Selection of parameters for the tracking function of EXTREF

TRACKC	**Description**
0	No tracking
1	The external setpoints EXTREF1 and EXTREF2 are not affected. Changeover to operating mode E1 or E2 respectively takes place bumplessly by the working setpoint, WSP, taking on the measured value, MV. Thereafter WSP is ramped to equal EXTREF1 or EXTREF2 as applicable with a speed that is determined by SPEED2 or SPEED3 respectively. ”Tracking” of EXTREF1 takes place in the operating modes BAL, MAN, E2 and E3, while ”tracking” of EXTREF2 takes place in the modes BAL, MAN, E1 and E3.
2	The external setpoints EXTREF1 and EXTREF2 are not affected. Changeover to operating mode E1 or E2 respectively takes place bumplessly by the working setpoint, WSP, retaining its value from the preceding mode. Thereafter WSP is ramped to equal EXTREF1 or EXTREF2 as applicable with a speed that is determined by SPEED2 or SPEED3 respectively. ”Tracking” of EXTREF1 takes place in the operating modes BAL, MAN, E2 and E3, while ”tracking” of EXTREF2 takes place in the modes BAL, MAN, E1 and E3.

REVACT

REVACT	**Function PI-part**	**Function D- part**
0	direct	direct
1	reverse	reverse
2	direct	reverse
3	reverse	direct

HOTINIT

Function on warm start		
HOTINIT	**Mode**	**Output**
0	unchanged	unchanged
1	MAN	unchanged
2	MAN	0 or OLL
Unchanged means: no change in relation to the state in effect before the event that caused the warm start.		

2.4.1 Connections to Data Base Elements

The following connections are made in the PC program to transfer information between PC element and data base elements.

Table 2-1. Connections to data base elements

No	Name	Terminal in data base element
1	PARAM1	PARAM1
4	PARAM2	PARAM2
15	PARAM3A	PARAM3
29	DBINST	Either DB=NAME or D=INSTANCE NUMBER of data base element
30	PARAM4	PARAM4
31	PARAM5	PARAM5
32	PARAM6	PARAM6
36	OUTP	POUT
42	PARAM3B	PARAM3

If C4 = 1, in addition,

91	PARAM7	PARAM7

If C5 = 1, in addition,

116	PARAM8	PARAM8

If C6 = 1, in addition,

133	PARAM9	PARAM9

In addition, the measured value input MV and the output signal OUT are connected to I/O in the normal manner.

If three-point control is required together with PC element CON-PU1, the actuator position can be coupled to PIDCON’s data base element connection ACTPOS for presentation in an object display.

2.5 Data Base Element PIDCON

Information about the data base element in the functional unit PIDCON is given in data sheet form. This data sheet is included in the manual *Data Base Elements Advant Controller 400 Series Reference Manual* in which all of the data base elements included in the Advant Controller 410/450 products are assembled.

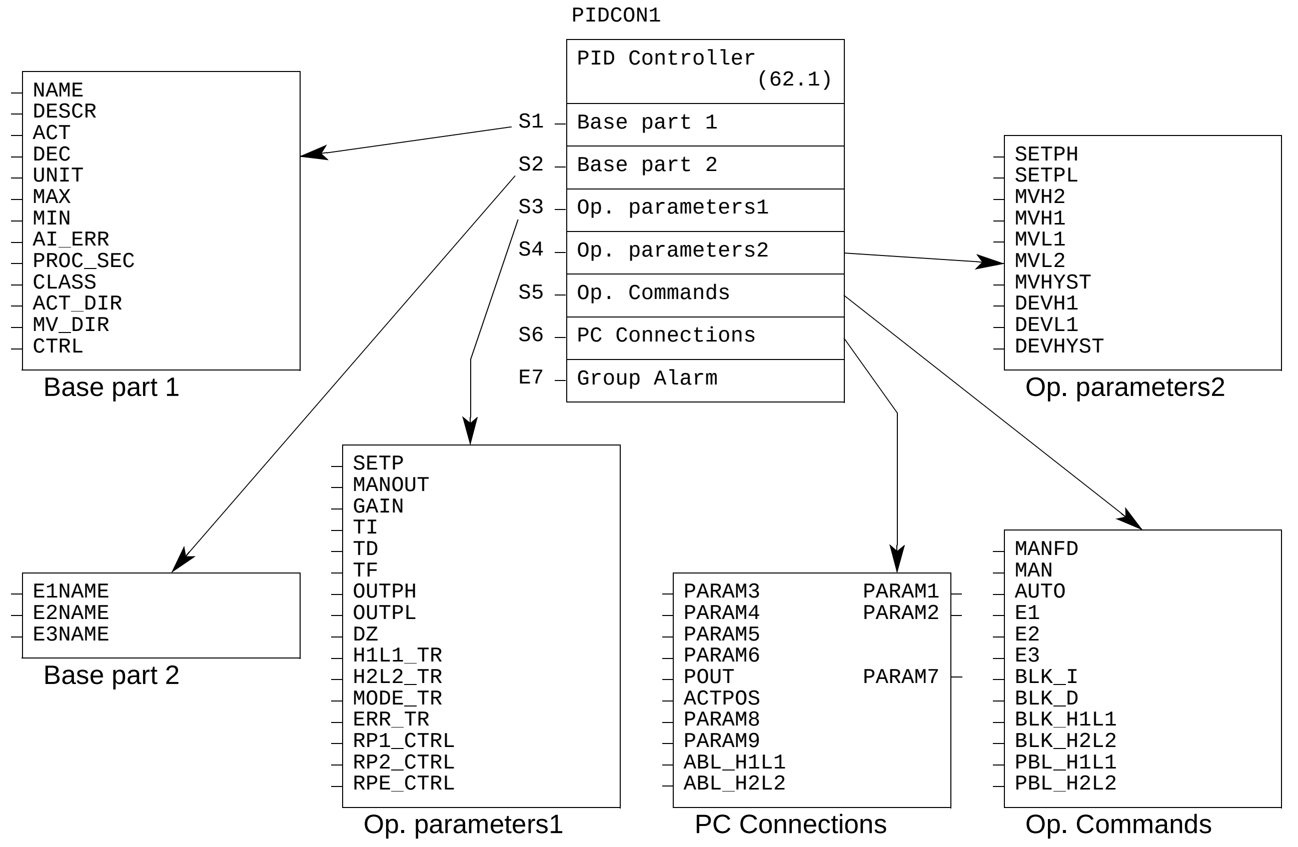
PID Controller PIDCON

Summary

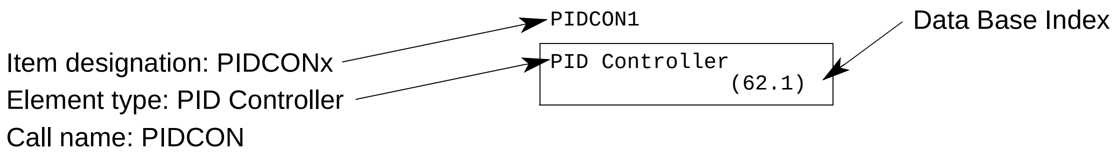
The PID Controller data base element is used to build up Advant Station 500 Series Operator Station functions for the PIDCON functional unit. Some static information in the displays can be given. Parameters which can be changed from the dialog can be given start values. The element performs an interface between the PC-program/process function and Advant Station 500 Series Operator Station.

For information about the extension parts of Group Alarm see data base element Group Member.

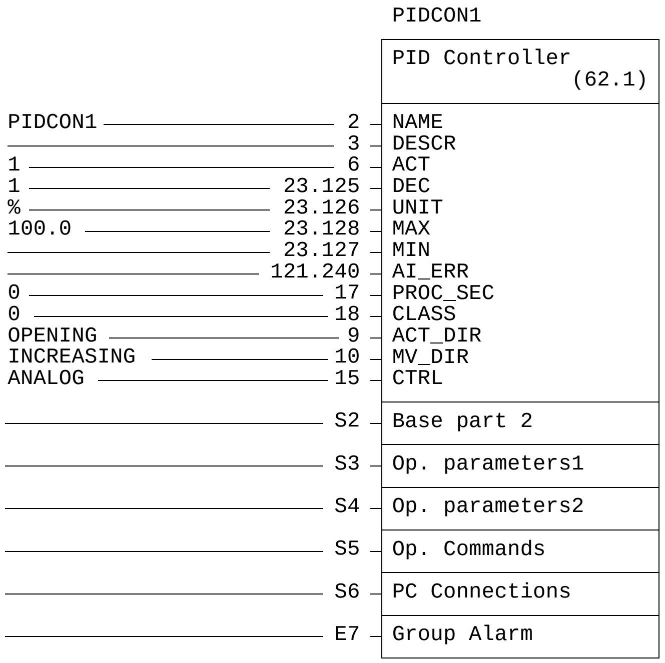
Overview



Head



Base part 1



Terminal Description, Base part 1

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
2	NAME	user	PIDCONx	–	Each Process Controller must have a unique **NAME**. E.g. TICA107.	Max. 20 characters. Spaces are not allowed.
3	DESCR	user	–	–	This **DESCR**iption of the Process Controller will be shown in Operator Station.	Max. 20 characters. Any information regarding the object may be entered.
6	ACT	user	1	B(r/w)	1=operator communication is **ACT**ive.	0=dialog is blocked and events are not updated.

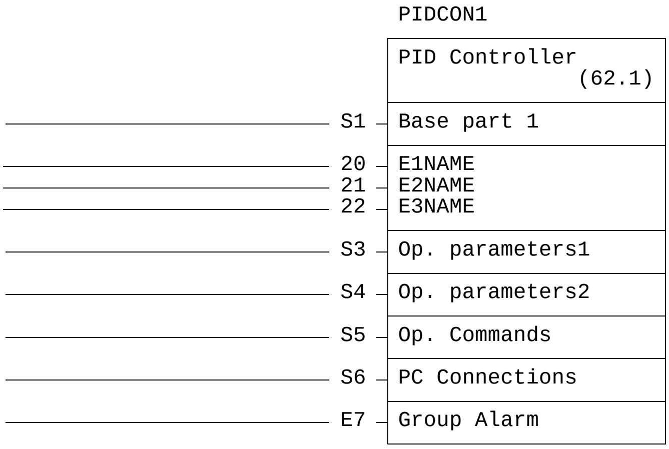
Terminal Description, Base part 1 (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
23.125	DEC	user	1	–	The number of **DEC**imals for measured value and its alarm limits and for setpoint and autosetpoint and range min and range max.	A total number of 5 figures plus point and sign can be presented. 0..6 decimals.
23.126	UNIT	user	%	A6(r)	The **UNIT** of the measured value and setpoint in engineering unit.	Max. 6 characters shown in Operator Station and data base element.
23.128	MAX	user	100.0	R(r/w)	**MAX**imum value within measuring range.	Used for scaling of bar graph. If the parameter is controlled by PC-program please see Application note in function description.
23.127	MIN	user	0.0	R(r/w)	**MIN**imum value within measuring range.	Used for scaling of bar graph. If the parameter is controlled by PC-program please see Application note in function description.
121.240	AI_ERR	user	–	–	**AI ERR**or. Reference to the Analog Input element which is used for the measured value.	Connects error flag in the analog input to PIDCON. E.g. FT 107. An initiation must be made in the Advant Controller 400 Series system before the change is accomplished.
17	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
18	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station	–
9	ACT_DIR	user	OPE NING	B(r/w)	**ACT**uator **DIR**ection. Used for presentation in the object and group displays: OPENING: actuator open at 100% output. CLOSING: actuator closed at 100% output.	–
10	MV_DIR	user	INCREA SING	B(r/w)	**M**easured **V**alue **DIR**ection. Used for presentation in the object and group displays: INCREASING: measured value increases at increasing output. DECREASING: measured value decreases at increasing output.	–

Terminal Description, Base part 1 (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
15	CTRL	user	ANALOG	B(r)	**C**on**TR**o**L**. ANALOG: analog output signal. ON-OFF: three position control by two logical output signals.	Logical output requires the use of CONPU1. When CTRL=ON-OFF the actuator position and the dead zone are presented on the object display.

Base part 2



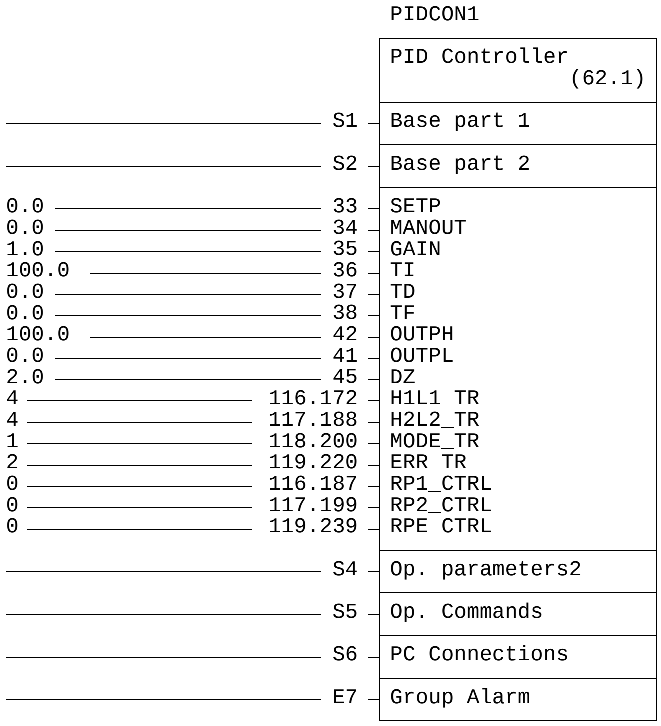
Terminal Description, Base part 2

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
20	E1NAME	user	–	–	**NAME** of **E**xternal reference **1**.	The text entered here will be presented in the object display under ”CONTROL MODE”. Maximum 20 characters.
21	E2NAME	user	–	–	**NAME** of **E**xternal reference **2**.	The text entered here will be presented in the object display under ”CONTROL MODE”. Maximum 20 characters.

Terminal Description, Base part 2 (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
22	E3NAME	user	–	–	**NAME** of **E**xternal reference **3**.	The text entered here will be presented in the object display under ”CONTROL MODE”. Maximum 20 characters.

Operators parameters1



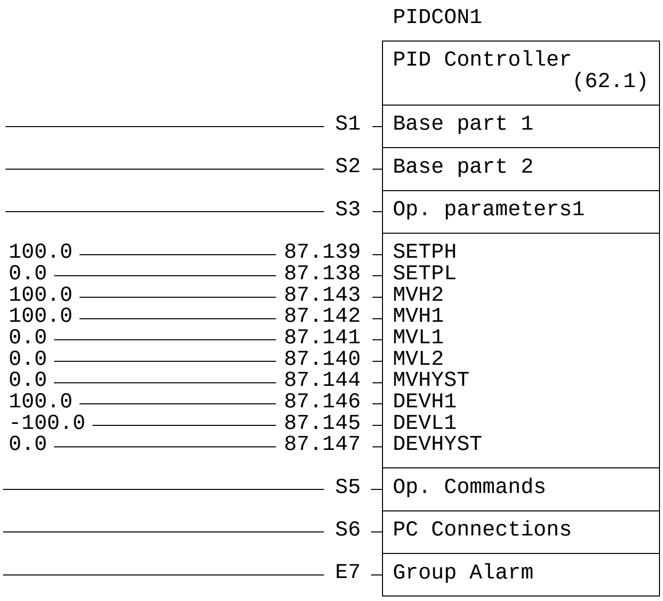
Terminal Description, Operators parameters1

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
33	SETP	dialog	0.0	R(r/w)	Auto **SETP**oint.	–
34	MANOUT	dialog	0.0	R(r/w)	**MAN**ual **OUT**put.	–
35	GAIN	dialog	1.0	R(r/w)	**GAIN** value.	–
36	TI	dialog	100.0	R(r/w)	**I**ntegration **T**ime (reset time) in seconds.	–
37	TD	dialog	0.0	R(r/w)	**D**ifferential **T**ime in seconds.	–
38	TF	dialog	0.0	R(r/w)	**F**ilter **T**ime constant for derivative part in seconds.	–
42	OUTPH	dialog	100.0	R(r/w)	**OUTP**ut **H**igh limit (%).	–
41	OUTPL	dialog	0.0	R(r/w)	**OUTP**ut **L**ow limit (%).	–
45	DZ	dialog	2.0	R(r/w)	**D**ead **Z**one (%).	Read by CON-PU1 when used.
116.172	H1L1_TR	user	4	–	Alarm **H1** and **L1** **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of the alarms H1, L1 and control deviation.	–
117.188	H2L2_TR	user	4	–	Alarm **H2** and **L2** **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of the alarms H2 and L2.	–
118.200	MODE_TR	user	1	–	**MODE** **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of PC-controlled control modes.	–
119.220	ERR_TR	user	2	–	**ERR**or **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of signal error in the analog input connected to the controller.	–
116.187	RP1_CTRL	user	0	–	**R**e**P**eat fail **C**on**TR**o**L** for alarms H**1** and L**1**. Blocking of repeating H1 and L1 alarms.	–

Terminal Description, Operators parameters1 (Continued)

Terminal No	**Terminal Name**	**Value entered by**	**Default value**	**PC connection data type**	**Description**	**Remarks**
117.199	RP2_CTRL	user	0	–	**R**e**P**eat fail **C**on**TR**o**L** for alarms H**2** and L**2**. Blocking of repeating H2 and L2 alarms.	–
119.239	RPE_CTRL	user	0	–	**R**e**P**eat fail **C**on**TR**o**L** for signal **E**rror. Blocking of repeating signal error in the analog input connected to the controller.	–

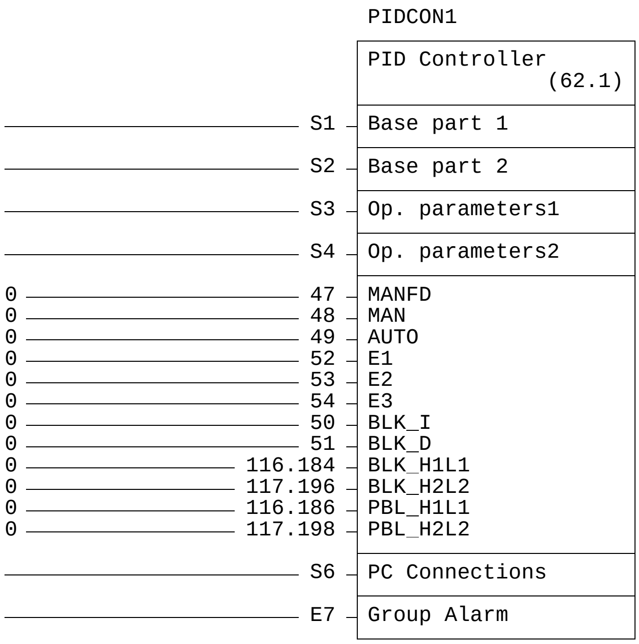
Operators parameters2



Terminal Description, Operators parameters2

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
87.139	SETPH	dialog	100.0	R(r/w)	**H**igh limit of **SETP**oint.	–
87.138	SETPL	dialog	0.0	R(r/w)	**L**ow limit of **SETP**oint.	–
87.143	MVH2	dialog	100.0	R(r/w)	Alarm limit **H2** of **M**easured **V**alue.	–
87.142	MVH1	dialog	100.0	R(r/w)	Alarm limit **H1** of **M**easured **V**alue.	–
87.141	MVL1	dialog	0.0	R(r/w)	Alarm limit **L1** of **M**easured **V**alue.	–
87.140	MVL2	dialog	0.0	R(r/w)	Alarm limit **L2** of **M**easured **V**alue.	–
87.144	MVHYST	dialog	0.0	R(r/w)	**HYST**eresis for alarm limits of **M**easured **V**alue.	–
87.146	DEVH1	dialog	100.0	R(r/w)	**H**igh alarm limit **1** for control **DEV**iation (%).	–
87.145	DEVL1	dialog	–100.0	R(r/w)	**L**ow alarm limit **1** for control **DEV**iation (%).	–
87.147	DEVHYST	dialog	0.0	R(r/w)	**HYST**eresis for alarm limits for **DEV**iation.	–

Operators Commands



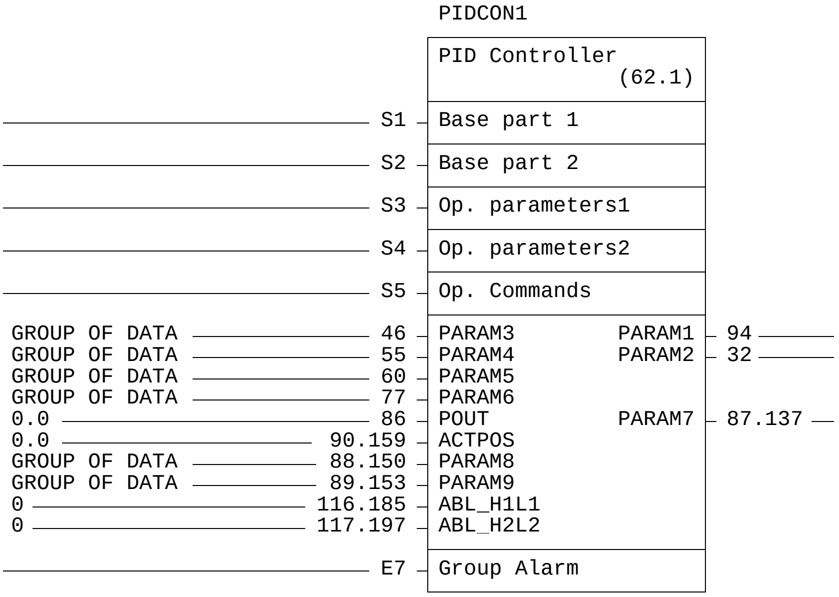
Terminal Description, Operators Commands

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
47	MANFD	dialog	0	B(r)	**MAN**ual **F**orce**D** mode.	–
48	MAN	dialog	0	B(r)	**MAN**ual mode.	Converted to a pulse by the system.
49	AUTO	dialog	0	B(r)	**AUTO**matic mode.	Converted to a pulse by the system.
52	E1	dialog	0	B(r)	**E**xternal mode **1** (Setpoint).	Converted to a pulse by the system.
53	E2	dialog	0	B(r)	**E**xternal mode **2** (Setpoint).	Converted to a pulse by the system.
54	E3	dialog	0	B(r)	**E**xternal mode **3** (Output).	–
50	BLK_I	dialog	0	B(r)	**BL**oc**K** **I**ntegral part.	–
51	BLK_D	dialog	0	B(r)	**BL**oc**K** **D**erivative part.	–
116.184	BLK_H1L1	dialog	0	–	**BL**oc**K** alarms **H1** and **L1**.	–
117.196	BLK_H2L2	dialog	0	–	**BL**oc**K** alarms **H2** and **L2**.	–

Terminal Description, Operators Commands (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
116.186	PBL_H1L1	dialog	0	–	**BL**ock **P**rinter for **H1** and **L1** alarms. Blocking of printer for H1, L1 and control deviation alarms.	–
117.198	PBL_H2L2	dialog	0	–	**BL**ock **P**rinter for **H2** and **L2** alarms. Blocking of printer for H2and L2 alarms.	–

PC Connections



Terminal Description, PC Connections

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
46	PARAM3	PC	–	I(r/w)	Group of data to be connected to the PC element connections **PARAM3**A and **PARAM3**B.	–
55	PARAM4	PC	–	I(r/w)	Group of data to be connected to the PC element connection **PARAM4**.	–
60	PARAM5	PC	–	IL(r/w)	Group of data to be connected to the PC element connection **PARAM5**.	–

Terminal Description, PC Connections (Continued)

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
77	PARAM6	PC	–	A32(r/w)	Group of data to be connected to the PC element connection **PARAM6**.	–
86	POUT	PC	0.0	R(r/w)	To be connected to the PC element connection **OUTP**.	–
90.159	ACTPOS	PC	0.0	R(r/w)	To be connected to the AI channel measuring the **ACT**uator **POS**ition (Transferred by a PC-element).	The value will be presented in the object display if CTRL=ON-OFF. If CTRL=ANALOG, then ACTPOS is not used.
88.150	PARAM8	PC	–	A8 (r/w)	Group of data to be connected to the PC element connection **PARAM 8** if C5=1.	–
88.153	PARAM9	PC	–	A16(r/w)	Group of data to be connected to the PC element connection **PARAM9** if C6=1.	–
116.185	ABL_H1L1	PC	0	B(r/w)	**A**uto **BL**ock alarms **H1** and **L1**.	See section Application Example in functional description.
117.197	ABL_H2L2	PC	0	B(r/w)	**A**uto **BL**ock alarms **H2** and **L2**.	See section Application Example in functional description.
94	PARAM1	system	–	I(r/w)	Group of data to be connected to the PC element connection **PARAM1**.	–
32	PARAM2	system	–	A48 (r/w)	Group of data to be connected to the PC element connection **PARAM2**.	–
87.137	PARAM7	system	–	A48 (r/w)	Group of data to be connected to the PC element connection **PARAM7** if C4=1.	–

2.6 Operator Functions

The Operator functions are divided in principle into 3 parts:

- Presentation (Display elements, Time logged properties)
- Dialog
- Event handling

2.6.1 Presentation

Display elements which can be used for different display types are available for use in the functional unit PIDCON.

The display elements show the status and the controls of the process with different degrees of detail and is intended for the following displays:

- Object display
- Group display
- Object closeup display
- Process display

Examples of different display elements which could be used in these displays are given in the following section. A complete list of the prepared elements available is provided in the manual *AdvaCommand User Interface Reference Manual*.

Detailed information about alternative ways of presenting certain status and data within the displays such as color, flashing, blocked etc. is given in the reference manual.

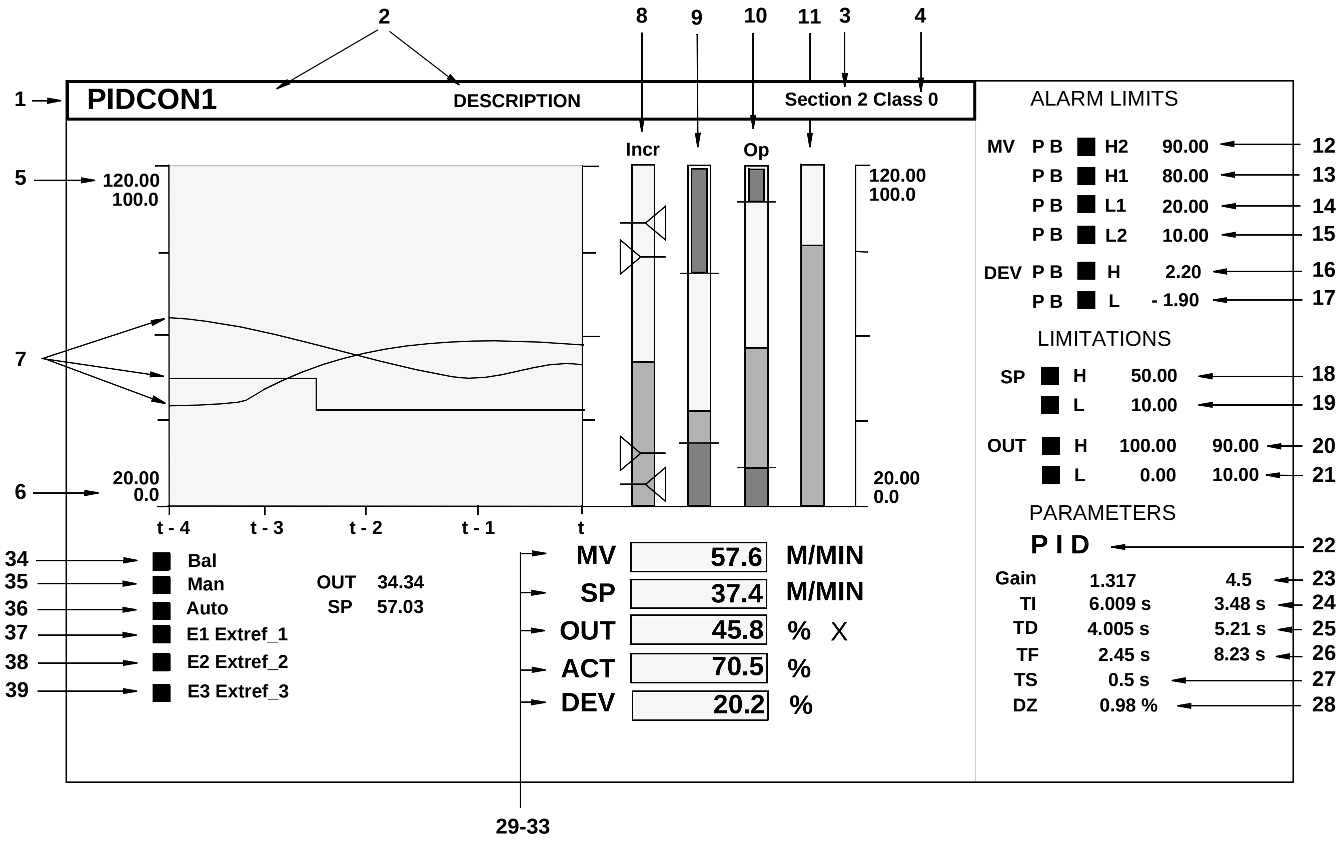
Time-logged Properties

Measured values stored can be presented graphically in the form of curves on the display screen. Such a display, a **trend display**, can consist of 1-4 curves.

For PIDCON, the following measured values can be logged and presented in this way:

MV	Measured Value
SP	Setpoint
OUT	OUTput signal
DEV	Control DEViation
ACT	ACTuator position.

Object display: PIDOB01



No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Section	Text and value
4	Class	Text and value
5	MV Range Max	Range Max of the MV and SP value
	OUT Range Max	Range Max of OUT is 100.0 %
6	MV Range Min	Range Min of the MV and SP value
	OUT Range Min	Range Min of OUT is 0.0 %
7	Measure Value Trim Curve	Object measure value
	Setpoint Value Trim Curve	Object setpoint value
	Output Value Trim Curve	Object output value
8.1	Direction	
8.2	Measured Value Bargraph	

No	Description	Remarks
8.3	High Limit 2	Alarm High limit 2
8.4	High Limit 1	Warning High limit 1
8.5	Low Limit 1	Warning Low limit 1
8.6	Low Limit 2	Alarm Low limit 2
9.1	SP Value Bargraph	Setpoint value
9.2	High SP Limit	
9.3	Low SP Limit	
10.1	Opening or Closing	Actuator position
10.2	OUT Value Bargraph	Output value
10.3	High OUT Limit	
10.4	Low OUT Limit	
11	ACT Value Bargraph	Actuator value
12	ALARM LIMITS	

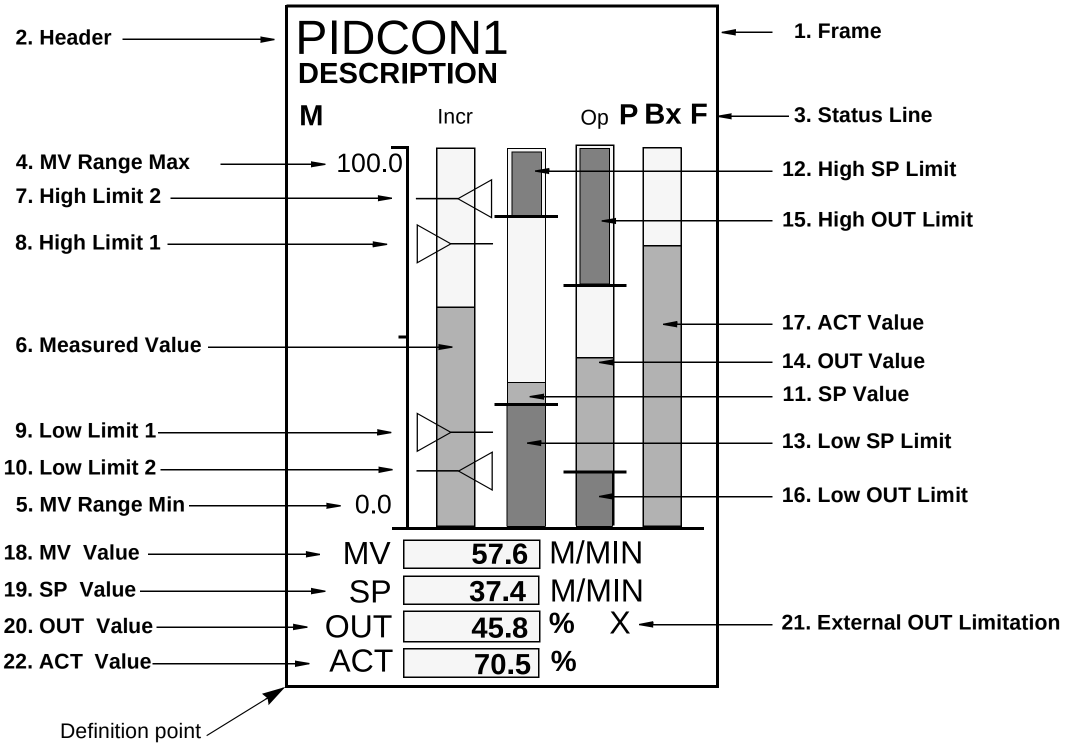
No	Description	Remarks
12.1	MV Text	
12.2	Printout blocked	
12.3	Alarm blocked	
12.4	Alarm Indication	
12.5	H2 Text	
12.6	H2 Value	High limit 2 value
13.1	Printout blocked	
13.2	Alarm blocked	
13.3	Alarm Indication	
13.4	H1 Text	
13.5	H1 Value	High limit 1 value
14.1	Printout blocked	
14.2	Alarm blocked	
14.3	Alarm Indication	
14.4	L1 Text	
14.5	L1 Value	Low limit 1 value
15.1	Printout blocked	
15.2	Alarm blocked	
15.3	Alarm Indication	
15.4	L2 Text	
15.5	L2 Value	Low limit 1 value
16.1	DEV	
16.2	Printout blocked	
16.3	Alarm blocked	
16.4	Alarm Indication	
16.5	H Text	
16.6	H Value	
17.1	Printout blocked	
17.2	Alarm blocked	
17.3	Alarm Indication	
17.4	L Text	
17.5	L Value	
18	LIMITATIONS	
18.1	SP Text	Setpoint
18.2	Warning Indication	
18.3	H Text	High limit setpoint
18.4	H Value	
19.1	Warning Indication	
19.2	L Text	Low limit setpoint
19.3	L Value	

No	Description	Remarks
20.1	OUT Text	Setpoint
20.2	Warning Indication	
20.3	H Text	High limit output
20.4	H Value	
20.5	External H value	External Output High value
21.1	Warning Indication	
21.2	L Text	Low limit output
21.3	L Value	
21.4	External L value	External Output Low value
22	PARAMETERS	
22.1	P	Gain active
22.2	I	Integration active
22	D	Derivation active
23.1	Gain	
23.2	Value	Value changed by operator
23.3	External Value	
24.1	TI	Integration Time
24.2	Value	Value changed by operator
24.3	Unit	
24.4	External Value	
24.5	External Unit	
25.1	TD	Deviation Time
25.2	Value	Value changed by operator
25.3	Unit	
25.4	External Value	
25	External Unit	
26.1	TF	Filter Time
26.2	Value	Value changed by operator
26.3	Unit	
26.4	External Value	
26.5	External Unit	
27.1	TS	Sampling Time
27.2	Value	
27.3	Unit	
28.1	DZ	Deadzone
28.2	Value	
28.3	Unit	
29.1	MV Text	
29.2	MV Value	
29.3	MV Unit	

No	Description	Remarks
30.1	SP Text	
30.2	SP Value	
30.3	SP Unit	
31.1	OUT Text	
31.3	OUT Unit	
31.4	External OUT Limitation Indication	OUT limited by external limitation
32.1	ACT Text	
32.2	ACT Value	
32.3	ACT Unit	
33.1	DEV Text	
33.2	DEV Value	
33.3	DEV Unit	
34.1	Bal Indication	Bal control mode
34.2	Bal Mode	
34.3		Bal Local control mode
35.1	Man Indication	Man control mode
35.2	Man Mode	

No	Description	Remarks
35.3		Man Local control mode
35.4	Man Out Text	
35.5	Man Out Value	
36.1	Auto Indication	Auto control mode
36.2	Auto Mode	
36.3	Auto Setpoint Text	
36.4	Auto Setpoint Value	
37.1	E1 Indication	E1 Control Mode
37.2	E1 Mode	
37.3	E1 Name	
38.1	E2 Indication	E2 Control Mode
38.2	E2 Mode	
38.3	E2 Name	
39.1	E3 Indication	E3 Control Mode
39.2	E3 Mode	
39.3	E3 Name	

Display Element for Group display: PIDGR01



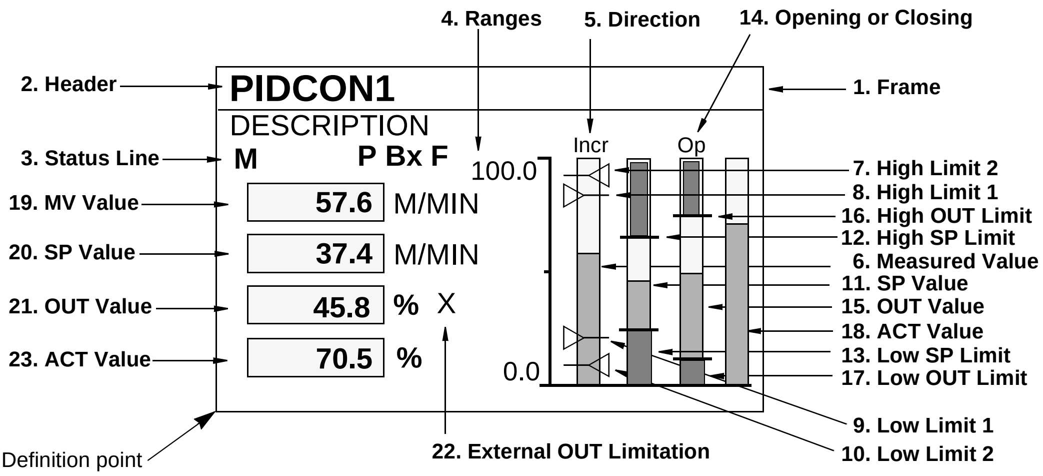
No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	
3.2	Direction	
3.3	Opening or Closing	Actuator position
3.4	Printout Blocked	
3.5	Alarm Blocked	
3.6	Alarm Indication	
4	MV Range Max	Max Range of the MV and SP values
5	MV Range Min	Min Range of the MV and SP values
6	Measured Value Bargraph	
7	High Limit 2	Alarm High limit 2
8	High Limit 1	Warning High limit 1
9	Low Limit 1	Warning Low limit 1
10	Low Limit 2	Alarm Low limit 2

No	Description	Remarks
12	High SP Limit	
13	Low SP Limit	
14	OUT Value Bargraph	Output value
15	High OUT Limit	
16	Low OUT Limit	
17	ACT Value Bargraph	Actuator value
18	Measured Value	
18.1	MV	
18.2	MV Value	
18.3	MV Unit	
19	Setpoint Value	
19.1	SP	
19.2	SP Value	
19.3	SP Unit	
20	Output Value	
20.1	OUT	

No	Description	Remarks
11	SP Value Bargraph	Setpoint value
20.3	OUT Unit	
21	Extern OUT Limitation	OUT limited by external limitation
22	Actuator Value	

No	Description	Remarks
20.2	OUT Value	
22.1	ACT	
22.2	ACT Value	
22.3	ACT Unit	

Display Element for Object closeup display: PIDWI01



No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	
3.3	Printout Blocked	
3.4	Alarm Blocked	
3.5	Alarm Indication	
4.1	Range Max	Max Range of the MV and SP values
4.2	Range Min	Min Range of the MV and SP values
5	Direction	
6	Measured Value	
7	High Limit 2	Alarm High limit 2
8	High Limit 1	Warning High limit 1
9	Low Limit 1	Warning Low limit 1
10	Low Limit 2	Alarm Low limit 2
11	SP Value Bargraph	Setpoint value

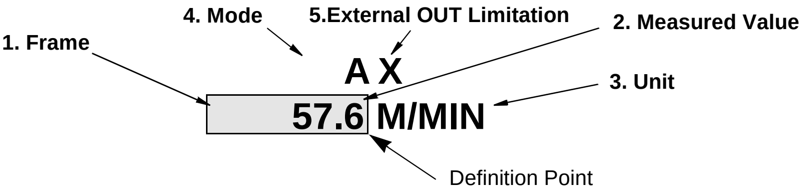
No	Description	Remarks
14	Opening or Closing	Actuator position
15	OUT Value Bargraph	Output value
16	High OUT Limit	
17	Low OUT Limit	
18	ACT Value Bargraph	Actuator value
19	Measured Value	
19.1	MV Value	
19.2	MV Unit	
20	Setpoint Value	
20.1	SP Value	
20.2	SP Unit	
21	Output Value	
21.1	OUT Value	
21.2	OUT Unit	
22	Ext OUT Limitation	OUT limited by external limitation
23	Actuator Value	

No	Description	Remarks
12	High SP Limit	
13	Low SP Limit	

No	Description	Remarks
23.1	ACT Value	
23.2	ACT Unit	

Display Element for Process display:

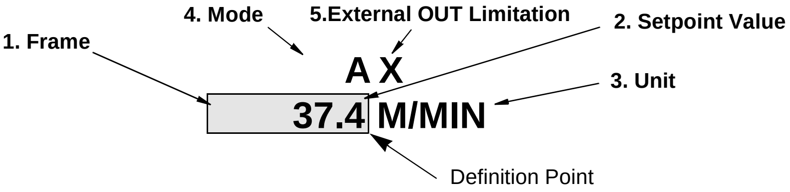
PIDPD01



No	Description	Remarks
1	SelectFrame	
2	Measured Value	
3	Unit	

No	Description	Remarks
4	Mode	
5	External OUT Limitation	

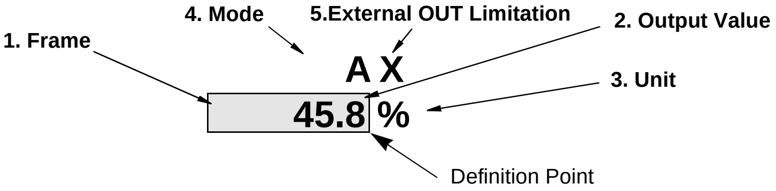
PIDPD02



No	Description	Remarks
1	SelectFrame	
2	Setpoint Value	
3	Unit	

No	Description	Remarks
4	Mode	
5	External OUT Limitation	

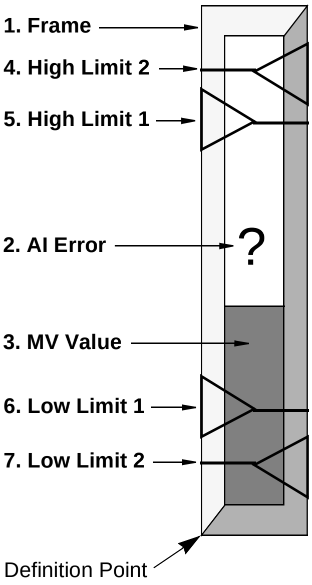
PIDPD03



No	Description	Remarks
1	SelectFrame	
2	Output Value	
3	Unit	

No	Description	Remarks
4	Mode	
5	External OUT Limitation	

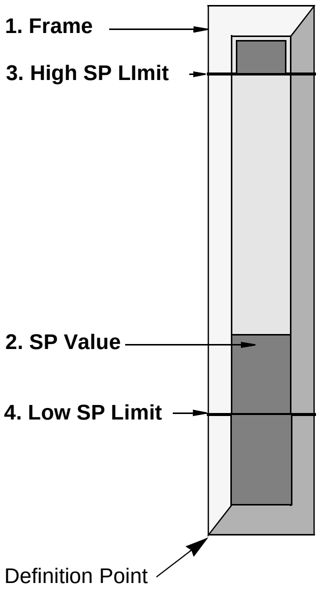
PIDPD51



No	Description	Remarks
1.1	SelectFrame	
1.2	TopLeftEdge	
1.3	BottomRightEdge	
2	AI Error	
3	MV Value	

No	Description	Remarks
4	High Limit 2	
5	High Limit 1	
6	Low Limit 1	
7	Low Limit 2	

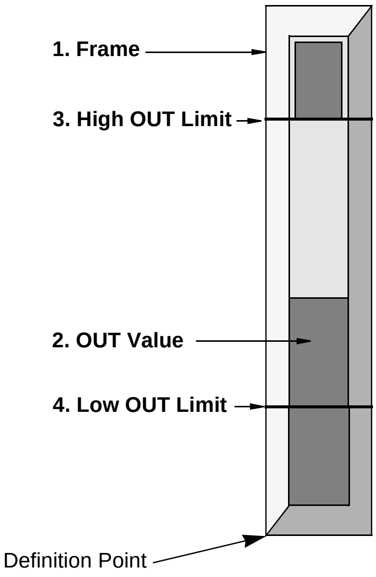
PIDPD52



No	Description	Remarks
1.1	SelectFrame	
1.2	TopLeftEdge	
1.3	BottomRightEdge	

No	Description	Remarks
2	Setpoint Value	
3	High SP Limit	
4	Low SP Limit	

PIDPD53



No	Description	Remarks
1.1	SelectFrame	
1.2	TopLeftEdge	
1.3	BottomRightEdge	

No	Description	Remarks
2	Output Value	
3	High OUT Limit	
4	Low OUT Limit	

2.6.2 Dialog

The display screen is supplemented with a keyboard for operator communication with the functional unit/object.

The dialog is built up using both fixed and dynamic keys. The functions available with the dynamic keys are presented in a pattern of rectangles on the lower part of the display screen when the object is selected. The functional unit PIDCON has a MIN dialog (Production level) and a MAX dialog (Maintenance level). The MIN dialog consists of an output dialog with 1 subdialog. The MAX dialog consists of an output dialog with 4 subdialogs.

MIN dialog (No authority key)

Keyboard keys

+ ↑	**Increase**	Increase output value with 0.5%
⇧ Shift **+** + ↑		Increase output value with 5.0%
↓ −	**Decrease**	Decrease output value with 0.5%
⇧ Shift **+** ↓ −		Decrease output value with 5.0%
Man	**Man**	Set to manual mode
Auto	**Auto**	Set to automatic mode
E1	**E1**	Set to external1 mode
E2	**E2**	Set to external2 mode
✓	**Acknowledge**	Acknowledge alarm
Object	**Object Display**	Select Object Display
📈	**Object Trend**	Select Object Trend
Dialog	**Previous Level**	Select Top Level dynamic keys

Dynamic keys, Top Level

D1 Man Forced	D2 E3	D3	D4	D5
D6 OUT	D7 SP	D8	D9	D10 *Keyboard…*

Man Forced	Set to manual forced mode
E3	Set to external3 mode
OUT	Check/change output value
SP	Check/change setpoint value
Keyboard…	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard

D1 ↑ Increase	D2 Man	D3 Auto	D4 E1	D5 E2
D6 ↓ Decrease	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Increase	Increase output value with 0.5%
Shift + Increase	Increase output value with 5.0%
Man	Set to manual mode
Auto	Set to automatic mode
E1	Set to external1 mode
E2	Set to external2 mode
Decrease	Decrease output value with 0.5%
Shift + Decrease	Decrease output value with 5.0%
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

MAX dialog (Authority key)

Keyboard keys

+ ↑	**Increase**	Increase output value with 0.5%
⇧ Shift + (+ ↑)		Increase output value with 5.0%
↓ −	**Decrease**	Decrease output value with 0.5%
⇧ Shift + (↓ −)		Decrease output value with 5.0%
Man	**Man**	Set to manual mode
Auto	**Auto**	Set to automatic mode
E1	**E1**	Set to external1 mode
E2	**E2**	Set to external2 mode
✓	**Acknowledge**	Acknowledge alarm
Object	**Object Display**	Select Object Display
📈	**Object Trend**	Select Object Trend
Dialog	**Previous Level**	Select Top Level dynamic keys
Dialog	**Next Block**	Page between the subdialogs

Dynamic keys, Top Level

D1 Man Forced	D2 E3	D3	D4 *Block…*	D5 *Limits…*
D6 OUT	D7 SP	D8	D9 *Parameters…*	D10 *Keyboard…*

Man Forced	Set to manual forced mode
E3	Set to external3 mode
Block…	Select Dynamic keys: Block
Limits…	Select Dynamic keys: Limits
OUT	Check/change output value
SP	Check/change setpoint value
Parameters…	Select Dynamic keys: Parameters
Keyboard…	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard

D1 ↑ Increase	D2 Man	D3 Auto	D4 E1	D5 E2
D6 ↓ Decrease	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Increase	Increase output value with 0.5%
Shift + Increase	Increase output value with 5.0%
Man	Set to manual mode
Auto	Set to automatic mode
E1	Set to external1 mode
E2	Set to external2 mode
Decrease	Decrease output value with 0.5%
Shift + Decrease	Decrease output value with 5.0%
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

Dynamic keys, Block…

D1 Block Alarm1	D2 Block Printout1	D3	D4 Block Alarm2	D5 Block Printout2
D6 Deblock Alarm1	D7 Deblock Printout	D8	D9 Deblock Alarm2	D10 Deblock Printout2

Block Alarm1	Block alarm1 indication
Block Printout1	Block event1 printout
Block Alarm2	Block alarm2 indication
Block Printout2	Block event2 printout
Deblock Alarm1	Deblock alarm1 indication
Deblock Printout1	Deblock event1 printout
Deblock Alarm2	Deblock alarm2 indication
Deblock Printout2	Deblock event2 printout

Dynamic keys, Limits…

D1 H1 80.00	D2 H2 90.00	D3 SP H 50.00	D4 DEV H1 2.20	D5 OUT H 100.00
D6 L1 20.00	D7 L2 10.00	D8 SP L 10.00	D9 DEV L1 -1.90	D10 OUT L 0.00

H1	Check/change measured value warning limit H1
H2	Check/change measured value alarm limit H2
SP H	Check/change upper warning limit setpoint
DEV H1	Check/change upper warning limit for deviation
OUT H	Check/change upper warning limit output
L1	Check/change measured value warning limit L1
L2	Check/change measured value alarm limit L2
SP L	Check/change lower warning limit setpoint
DEV L1	Check/change lower warning limit for deviation
OUT L	Check/change lower warning limit output

Dynamic keys, Parameters…

D1 Block I	D2 Block D	D3 Gain 1.32	D4 TI 6.01	D5 TD 4.01
D6 Deblock I	D7 Deblock D	D8	D9 TF 2.45	D10 DZ 0.98

Block I	Block integration
Block D	Block derivation
Gain	Check/change gain
TI	Check/change the time constant for integration
TD	Check/change the time constant for derivation
Deblock I	Deblock integration
Deblock D	Deblock derivation
TF	Check/change the filter time
DZ	Check/change deadzone

2.6.3 Event Handling

This chapter contains a description of all alarms and events in the functional unit PIDCON.

All these alarms and events are divided into groups. For each of these groups, there is an EVENT_TREAT pointer in the data base element. This pointer indicates a data base element of type EVENT_TREAT in Advant Station 500 Series Operator Station where the processing of the events of the group is defined. In the table below, the allocation of pointers to the different events and alarms is set out, which are defined for PIDCON. The table also shows the standard texts obtained in the event and alarm messages and the pointer numbers to user-defined texts in the EVENT_TREAT element indicated. The latter is of interest in case the standard texts are not suitable. The different event groups are described below.

Events of type 1 include passage of alarm limits L1, H1, DEVL and DEVH. An alarm is registered in the alarm list and event list when an error status is detected and in the event list when it is corrected. The event handling in the operator station can be blocked with the dialog (BLK H1/L1 or by applying a logic signal 1 at the PC input ALCBLK in PIDCON, or by applying a logical ’1’ to the input ABL_H1L1 on the data base element.

Events of type 2 include passage of alarm limits L2, H2. An alarm is registered in the alarm list and event list when an error status is detected and in the event list when it disappears. The event handling can be blocked with the dialog BLK H2/L2 or by applying a logical signal 1 at the PC input ALCBLK in PIDCON, or by applying a logical ’1’ to the input ABL_H2L2 on the data base element.

Events of type 3 include control mode changes commanded automatically (via PC inputs with suffix "FL"). Such changes are registered in the event list. The event handling cannot be blocked.

Events of type 4 are only errors in the measured value, AIERR. An alarm is registered in the alarm list and event list when an error status is detected and in the event list when it is corrected. The event handling cannot be blocked.

Table 2-2. Event Texts for PIDCON

Events	Event Treat pointer	Property text		Event text	
		Standard text	Line No in Event Treat	Standard text	Line No in Event Treat
Lower limit L1 for measured value exceeded	H1L1_TR	MV<L1	1	<Value> <Unit>	1
Lower limit L1 for measured value re-entered	H1L1_TR	MV<L1	1	<Value> <Unit>	2
Upper limit H1 for measured value exceeded	H1L1_TR	MV>H1	2	<Value> <Unit>	1
Upper limit H1 for measured value re-entered	H1L1_TR	MV>H1	2	<Value> <Unit>	2
Lower limit (1) for deviation exceeded	H1L1_TR	DEV<L	3	<Value> <Unit>	1

Table 2-2. Event Texts for PIDCON

Events	**Event Treat pointer**	**Property text**		**Event text**	
		Standard text	**Line No in Event Treat**	**Standard text**	**Line No in Event Treat**
Lower limit (1) for deviation re-entered	H1L1_TR	DEV<L	3	<Value> <Unit>	2
Upper limit (1) for deviation exceeded	H1L1_TR	DEV>H	4	<Value> <Unit>	1
Upper limit (1) for deviation re-entered	H1L1_TR	DEV>H	4	<Value> <Unit>	2
Lower limit L2 for measured value exceeded	H2L2_TR	MV<L2	1	<Value> <Unit>	1
Lower limit L2 for measured value re-entered	H2L2_TR	MV<L2	1	<Value> <Unit>	2
Upper limit H2 for measured value exceeded	H2L2_TR	MV>H2	2	<Value> <Unit>	1
Upper limit H2 for measured value re-entered	H2L2_TR	MV>H2	2	<Value> <Unit>	2
PC-gate LOCALFL decides control mode	MODE_TR	LOCAL !!	1	On	1
PC-gate MANFL decides control mode	MODE_TR	MAN !!	2	On	1
PC-gate AUTOFL decides control mode	MODE_TR	AUTO !!	3	On	1
PC-gate E1 decides control mode	MODE_TR	E1 !!	4	On	1
PC-gate E2 decides control mode	MODE_TR	E2 !!	5	On	1
PC-gate E3 decides control mode	MODE_TR	E3 !!	6	On	1
AI-error On	ERR_TR	AISign Err	1	Alarm	1
AI-error Off	ERR_TR	AISign Err	1	Normal	2

2.6.4 Group Alarm

It is possible to connect the functional unit PIDCON to the group alarm function. This function makes it possible to gather alarms and events from related process signals and objects into Alarm Groups. These groups are then treated as objects.

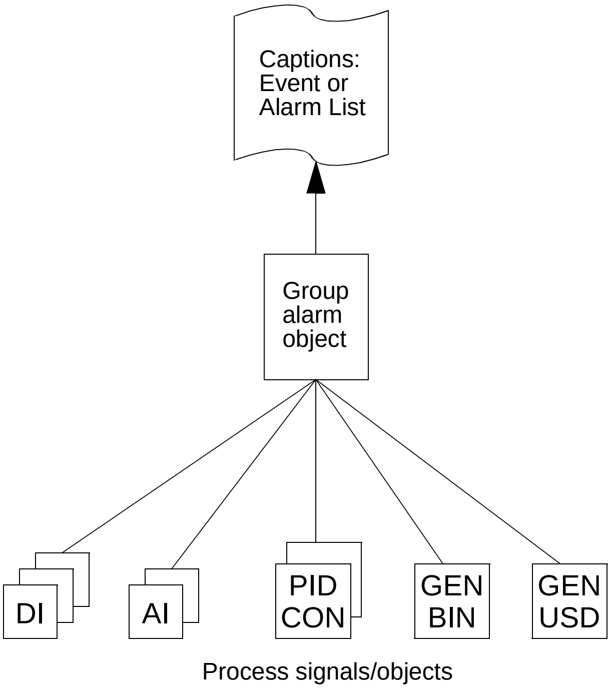


Figure 2-20. Group Alarm

The group alarm function consists of four parts as follows:

- Grouping of process alarms and events with a view to creating pilot alarms and events.
- Blocking of groups
- Automatic acknowledgement
- External alarm outputs.

For a more detailed description of the group alarm function, reference is made to the manual *AdvaCommand Basic Functions User’s Guide*.

2.7 Application Example

See the manual *MasterPiece 280 Application Notes*.

Particularly special applications of certain properties of the functional unit are commented on in the following:

- Control of the measured value measurement range.

  If, in certain cases, the parameter MAX or MIN in the data base element is controlled from a PC program to obtain improved resolution in the presentation of staples on the display screen, the following rules must be observed:

  a. The values of the parameters are utilized at system start (INIT) for the calculation of scaling factors utilized by the PC element in the calculation of DEV (control deviation) as a percentage. The program designer must thus ensure that MAX and MIN have correct values for this calculation at initialization. The values can be varied subsequently.

  b. Staples are only scaled at exchange of display. I.e. to obtain the correct function, the operator may be required to exchange the display. E.g. when a measured value changes and enters the smaller measurement range while the display is on the screen.

- Three different ways for PC programs to block alarms.

  – The alarm can be blocked by applying a control signal to the input ALCBLK of the PC element. In this way, the signal outputs from the PC element, MV_GT_H2, MV_GT_H1, MV_LT_L1, MV_LT_L2, DEV_GT_H1 and DEV_LT_L1, are also blocked. However, no indication of this is obtained on the displays.

  – Alarms can be blocked by applying a control signal to the input ALCBLK of the PC element and to the terminals ABL_H1L1 and ABL_H2L2 of the database element. In this way, both blocking of the signal outputs and indication on the displays are obtained.

  – If alarms are blocked by connecting a control signal to ABL_H1L1 and ABL_H2L2 only, this is indicated on displays but the signals outputs from the PC element stay unaffected.

2.8 Function Diagram

The function diagram in section A.2 in Appendix A describes in detail the logical relation between all input and output signals in the functional unit.

Chapter 3 RATIOSTN

3.1 General

The functional unit RATIOSTN is mainly intended for ratio control (the control of the relation between, for example different flows). This ratio control is performed in cooperation with a process controller PIDCON.

RATIOSTN as an independent functional unit is motivated by the requirement for operator-friendly entry of ratio factors in suitable process-related units and own dialog with operator's displays.

Characteristic properties

The following functions and properties are characteristic of the RATIOSTN ratio station:

- The ratio factor can be determined from the operator's station or controlled from a PC program
- Automatic tracking
- Limiting possibility for ratio value and output signal
- Integrated functions for bumpless switch-over from external to operator's ratio value
- Alarm or event handling of the more important signals

Examples of Ratio Control

Figure 3-1 shows a typical example of ratio control.

- The control is based on a ratio station RATIOSTN and a process controller PIDCON.
- Flow B is controlled to have a certain relation to flow A. The relation, the ratio factor, is set from the operator's keyboard.

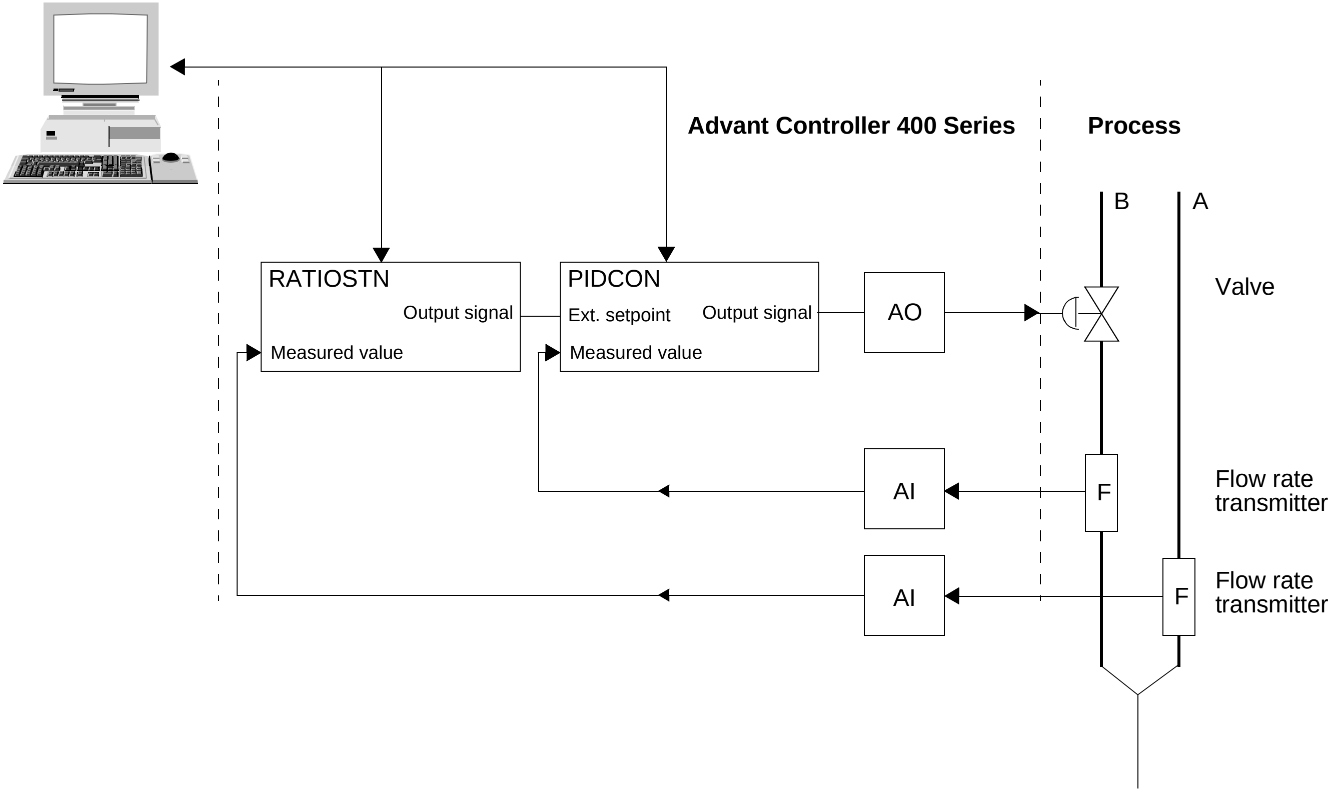


Figure 3-1. Example of ratio control with RATIOSTN

3.2 Configuration

The ratio station RATIOSTN consists of PC element, data base element and operator functions. The configuration is described in the manuals for the functional units. Figure 3-2 shows the illustration from part 1.

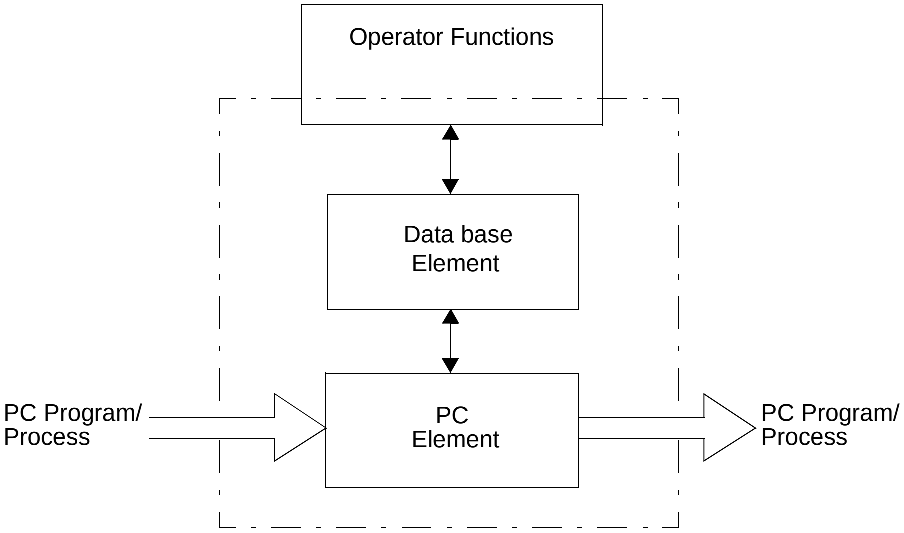


Figure 3-2. Principle of RATIOSTN configuration

Figure 3-3 and Figure 3-4 show the complete symbols for PC elements and data base elements respectively.

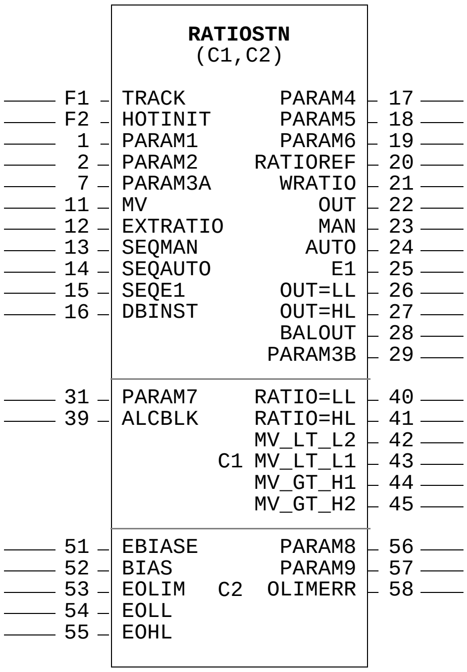


Figure 3-3. PC element, complete symbol

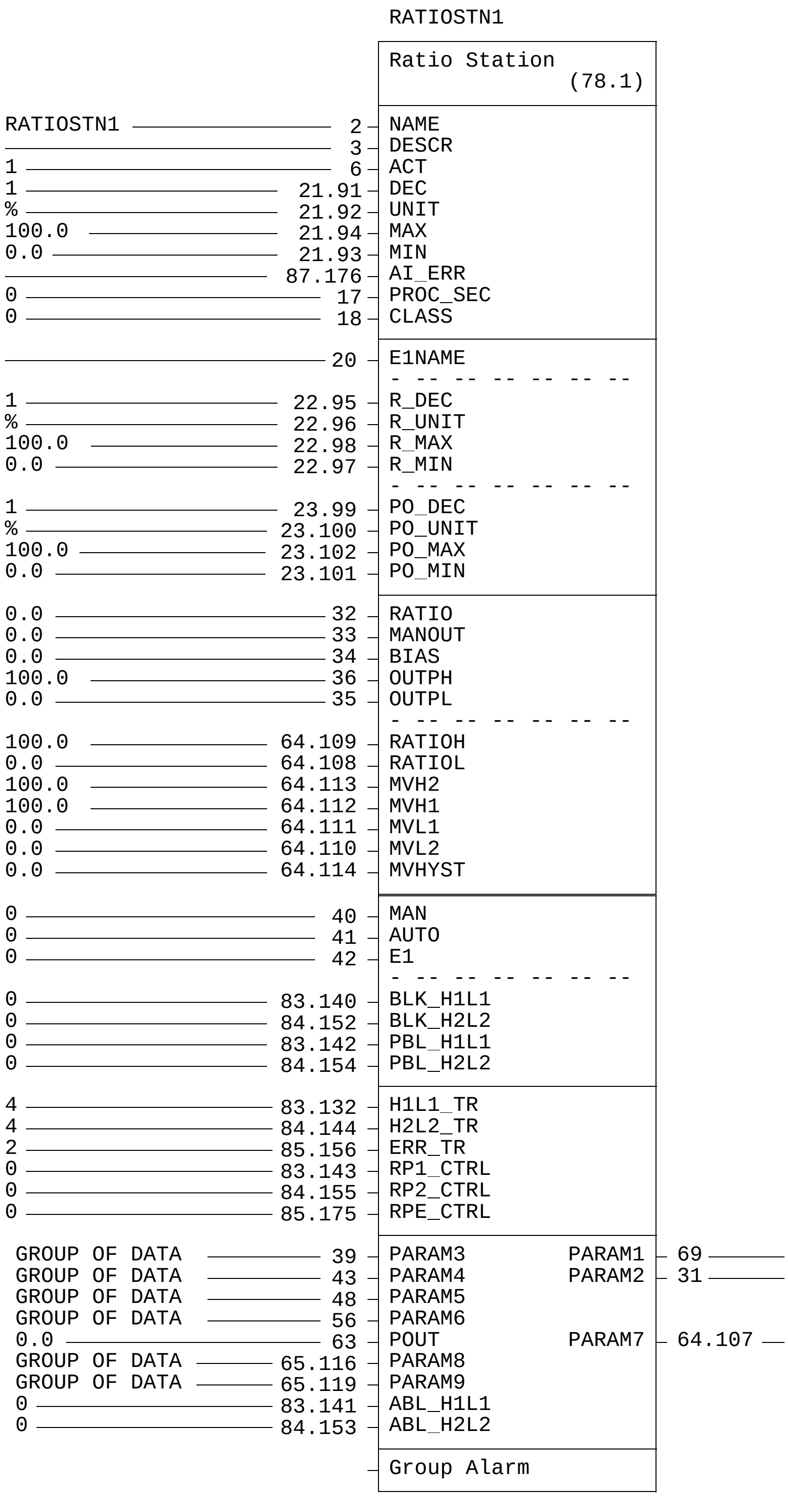


Figure 3-4. Data base element, complete symbol

3.3 Function

The properties of RATIOSTN are the result of an assembly of a number of subfunctions and their connections.

To understand the properties of the ratio station and thereby its possibilities, knowledge of the subfunctions and their connections is necessary.

This section describes the basic properties of the ratio station. A function block diagram is presented.

The subfunctions within each block in the function block diagram are described in detail in Section 3.3.1 Basic Properties - Section 3.3.4 Output Signal Control.

3.3.1 Basic Properties

Figure 3-5 shows the function block diagram of the ratio station. All blocks below MMC/DATA BASE ELEMENT are included in the PC element.

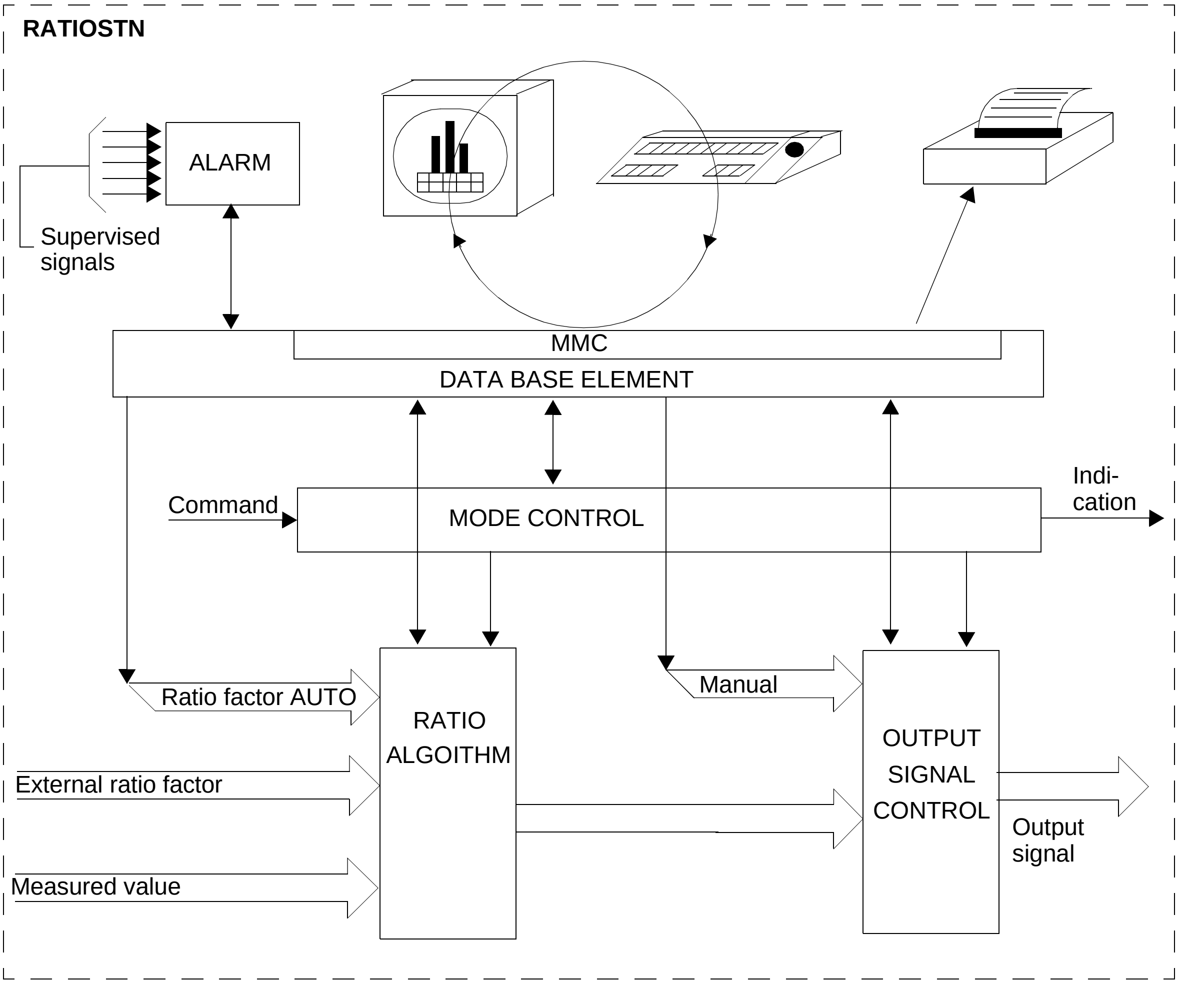


Figure 3-5. Function block diagram RATIOSTN

The properties of the ratio station are obtained through the functions described in the following:

A request for the control mode required is given by the operator or from other PC elements. The control mode selected is transmitted to the control signal functions and via the data base element and operator functions to the display screen.

The signal is also available for other purposes such as remote indication of the control mode The control mode selected completely determines the processing of the signals in the ratio station. The function description for each of the different control modes is therefore presented separately. Certain common properties should be mentioned before these function descriptions are begun (the figures in parantheses indicate the section in which the function concerned is presented).

- The highest and lowest values of the output signal can be subjected to limitations determined either from the operator's keyboard, from another PC element or from an external control device (Section 3.3.4 Output Signal Control).
- Tracking functions can be utilized on the ratio factor (Section 3.3.3 Ratio Algorithm).
- The ratio station works throughout with process-related units. There are no limitations beyond those set by the calculation algorithm and the number of characters which can be accommodated by the display element.
- The output signal is always bumpless on change-over to the manual control mode (Section 3.3.4 Output Signal Control).

Function Description MAN

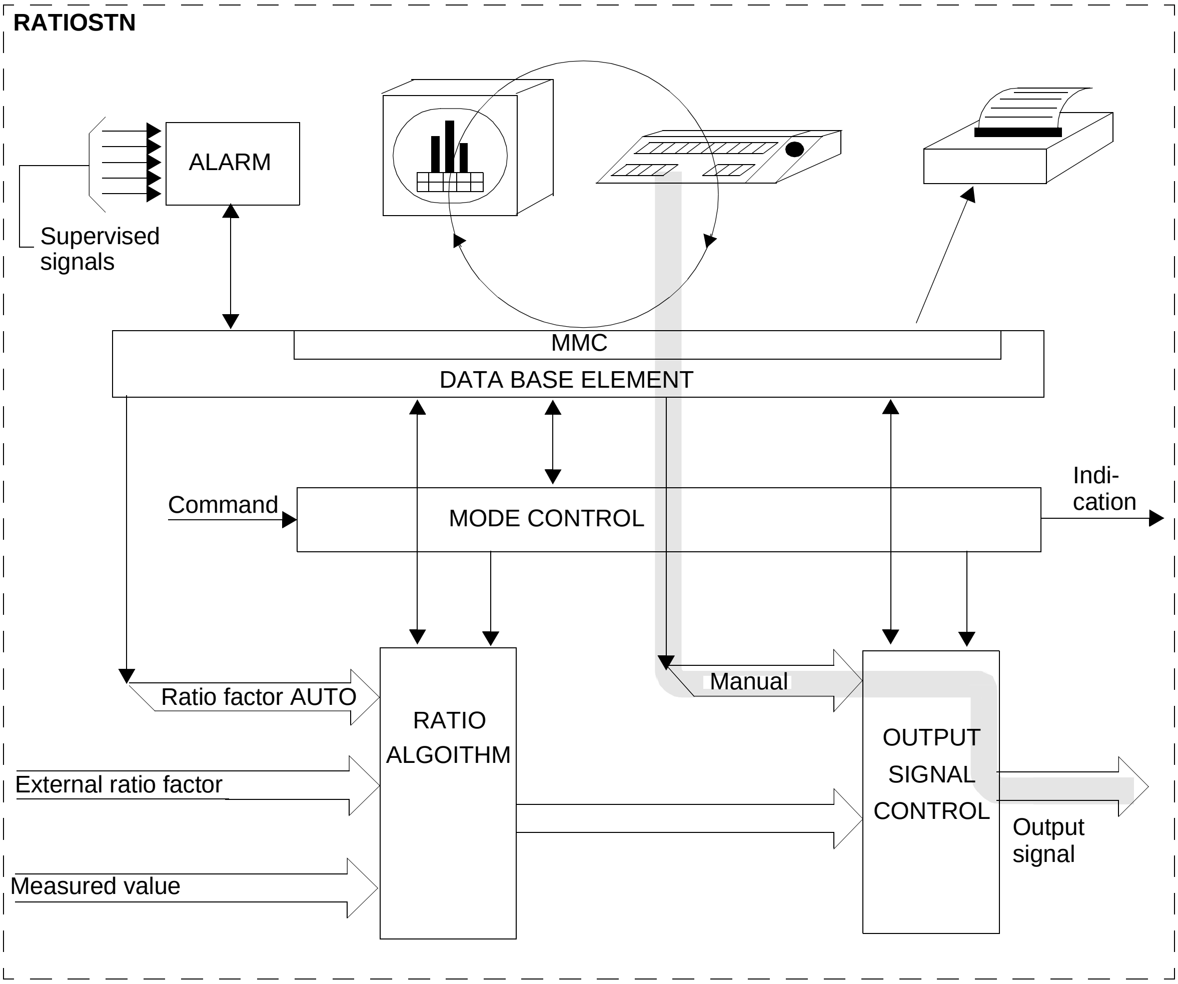


Figure 3-6. Signal flow with control mode MAN

When the control is in the MANual mode, the output signal is controlled by the operator via the keyboard. The control mode can be commanded from the operator's keyboard, from another PC element or from an external control device.

The control mode MAN can also be commanded automatically when an incorrect signal is received from an analog input (AI). This automatic command is described below under the heading CONTROL MODE.

NOTE

The control mode MAN is used when direct output signal control from the operator's keyboard is required.

Examples of use:

- Manual control under abnormal operational conditions e.g. in connection with malfunction
- Manual control at start and stop

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
Manual	MANOUT	DB-S3:33
Output signal	OUT	PC-C0:2

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 3-3.

Function Description AUTO

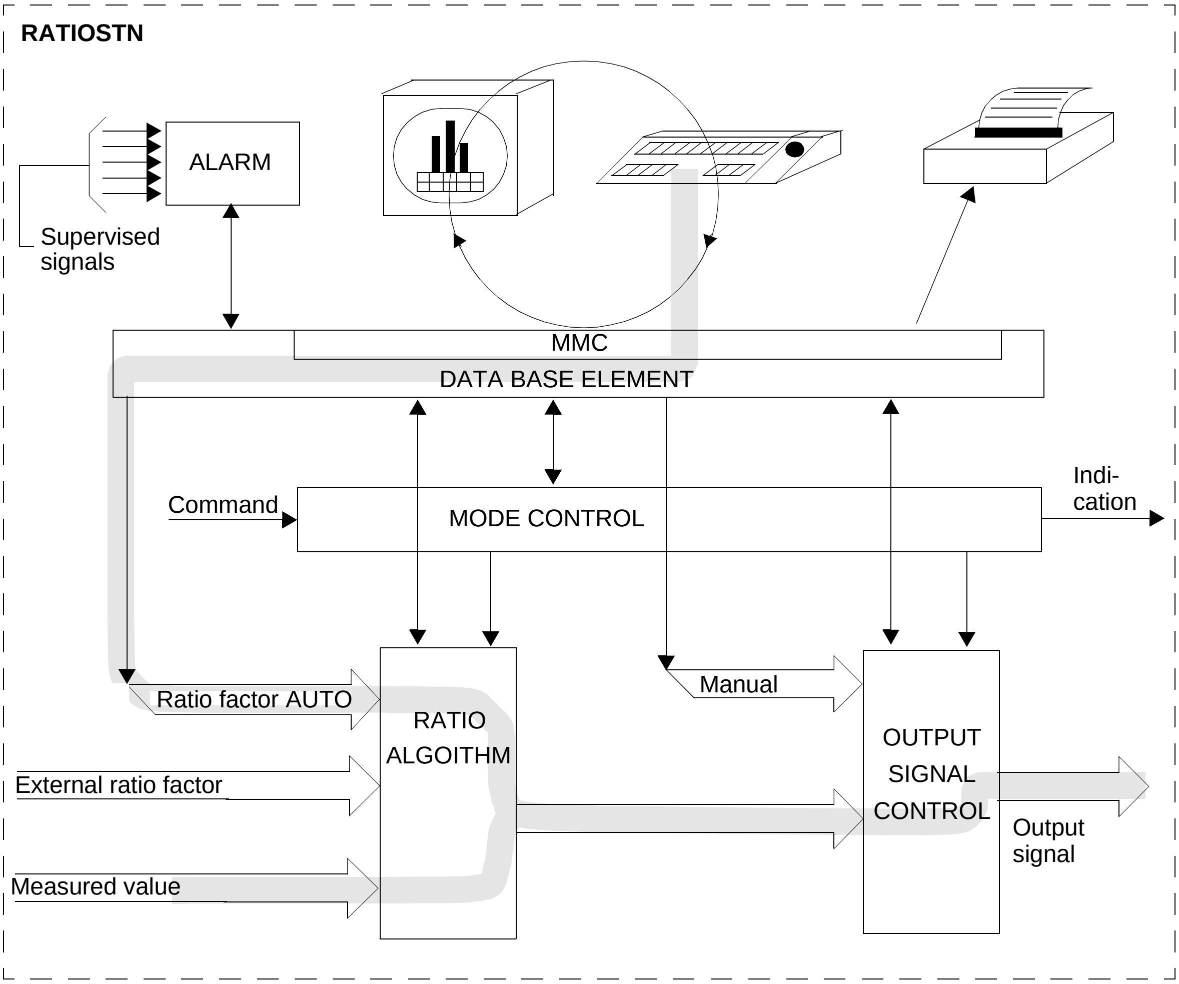


Figure 3-7. Signal flow with control mode AUTO

When the AUTO (automatic) control mode is selected, the ratio factor is determined by the operator via the keyboard. The internal ratio factor multiplied by the measured value from the process gives the output signal level.

The AUTO control mode can be commanded from the operator's keyboard, from another PC element or from an external control device.

NOTE

> The control mode AUTO is used when ratio control is required in which the ratio factor is set from the operator's keyboard.

Example of use:

- Flow control with a flow relation which the operator should normally be able to change

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
Internal ratio	RATIO	DB-S3:32
Measured value	MV	PC-C0:11
Output signal	OUT	PC-C0:22

[1] Location:

Element type–Element section:Terminal number

(where C0 =element header), see Figure 3-3.

Function Description E1

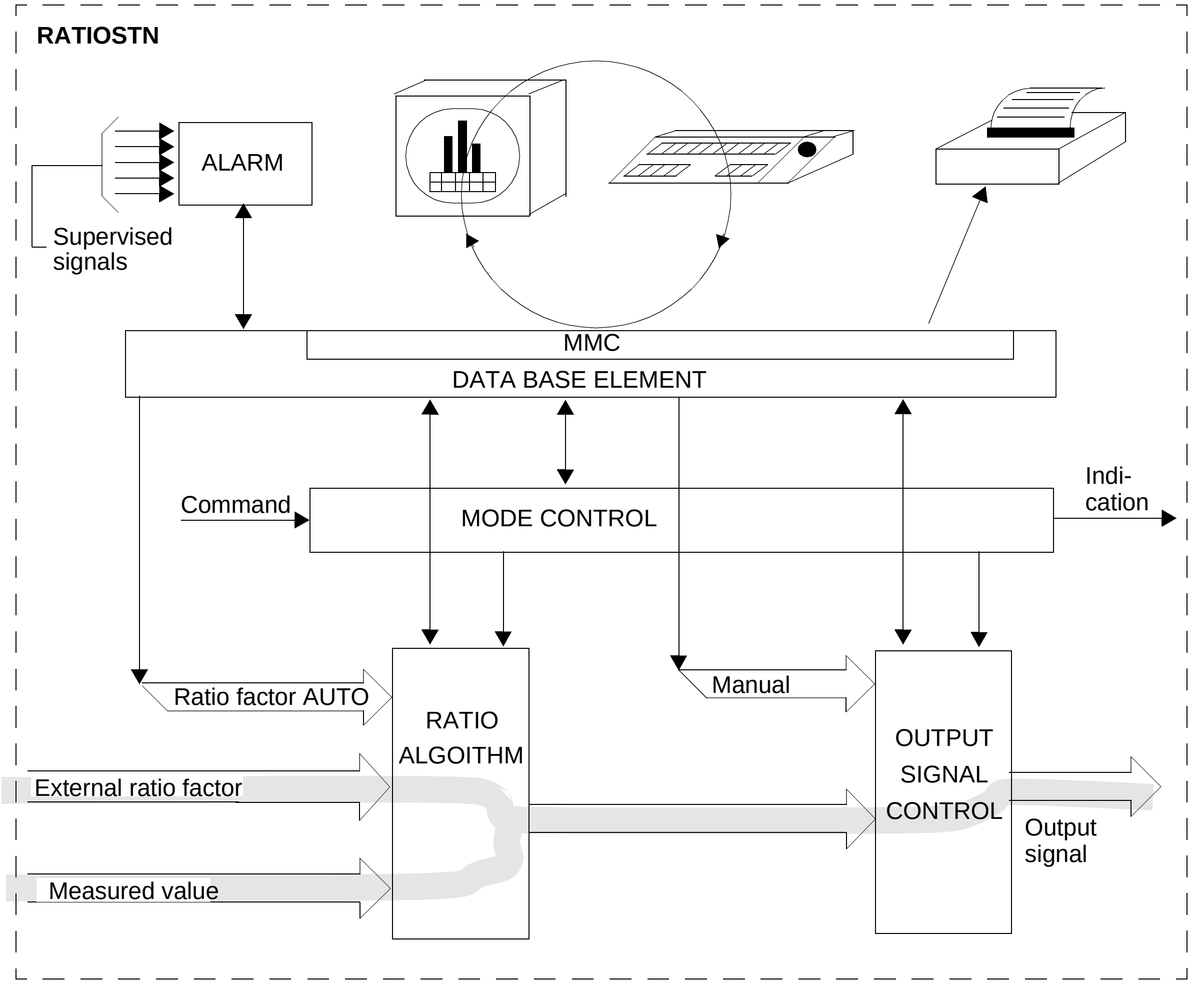


Figure 3-8. Signal flow with control mode E1

When the control mode E1 (external 1) is selected, the ratio factor consists of a signal received from an external source, an external ratio factor. The function is otherwise the same as in the control mode AUTO.

The control mode E1 can be commanded from the operator’s keyboard, from some other PC element or from an externalcontrol device.

NOTE

Control mode E1 is used when ratio control is required with a ratio factor obtained externally.

Examples of use:

- To obtain an optimum energy value when mixing two fuel flows with different specific energy, the mixing relation, the ratio, can be controlled from an analysis control.
- In a furnace control operation, the air/fuel relation can be determined by the O_2-content of the combustion gases.

The designations of the signals used in the description are as follows:

Designation	Abbreviation	Location [1]
External ratio factor	EXTRATIO	PC-C0:12
Measured value	MV	PC-C0:11
Output signal	OUT	PC-C0:22

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 3-3.

3.3.2 Control Mode

Figure 3-9 is a presentation of the function block MODE CONTROL. The figure contains a function table with the signals which constitute control mode change commands and signal outputs.

Control mode change

The inputs are of two different types: static (STAT) and dynamic (DYN).

STAT	An input of static type must be activated the whole time during which the corresponding control mode is in effect. If the signal disappears from the input, the control mode changes to MAN.
DYN	The dynamic input is only initiating. The control mode is selected when a change from 0 to 1 occurs at the input.

MAN

The control mode MAN is commanded by

AIERR	ERROR initiation of control mode MAN (see below).	
MAN	Change from the operator’s keyboard.	
SEQMAN	PC-C0:13	9

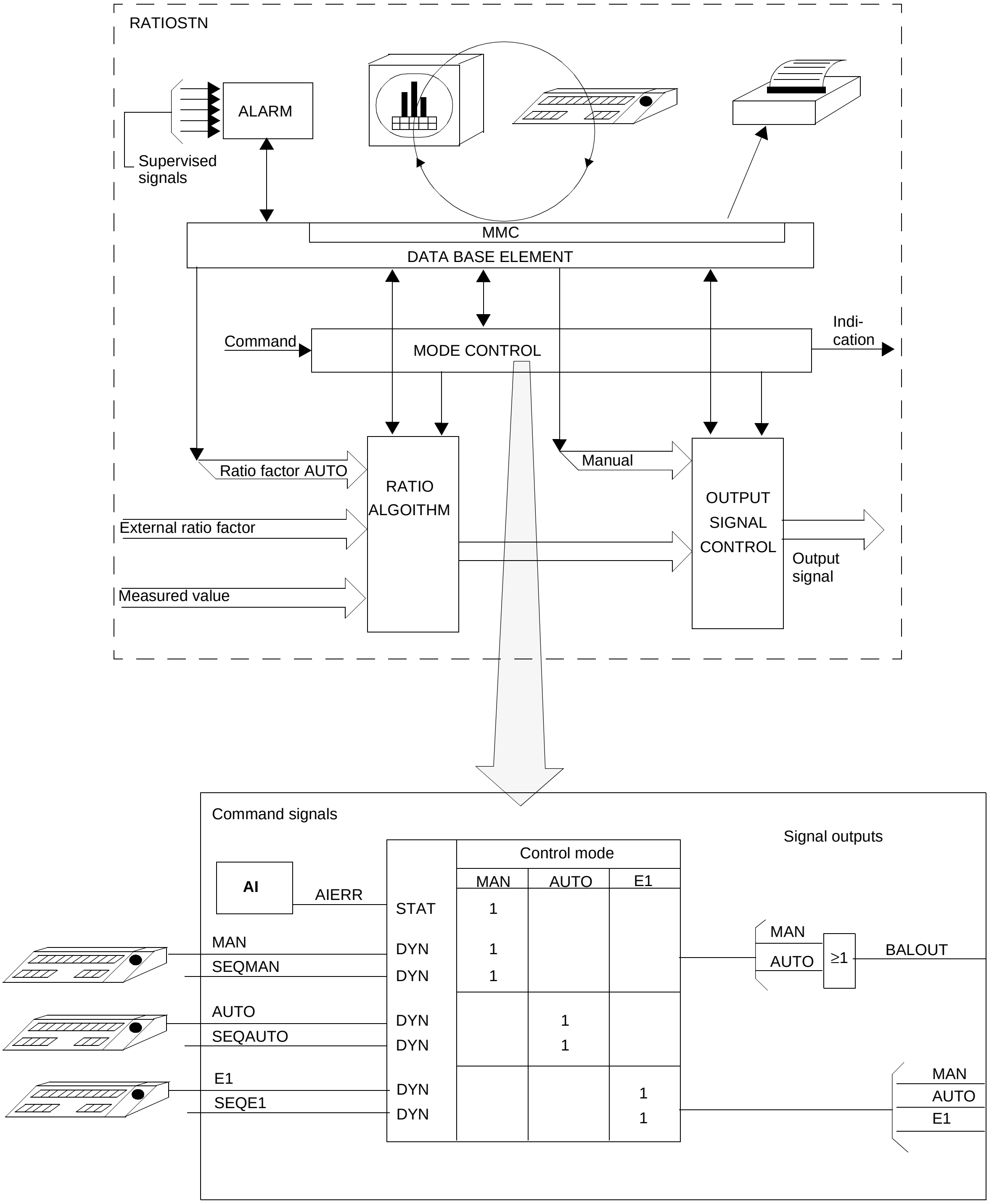


Figure 3-9. Function block MODE CONTROL

ERROR initiation of control mode MAN

A status signal, AIERR, is initiated from the analog input AI when certain faults develop. Examples of use:

- Loss of current signal
- Overflow
- Board fault (Diagnostic)

A/D converter malfunction

Information regarding the quality of the measured value is obtained from the AI and is copied to the ratio station for automatic correction of any error and for presentation. The AI concerned is pointed out at the population of the data base element for RATIOSTN.

When AI ERROR is activated, the control mode changes over to MAN and the output signal is frozen at its value when the error signal was generated. It is then possible to control the output signal manually.

When the error, (AI ERROR) disappears, all of the indications are reset to zero. The ratio station remains however in the control mode MAN until another control mode is requested automatically or by the operator.

AUTO

The control mode MAN is commanded by

Abbreviation	**Location** [1]	**Description**
AUTO		From the operator's keyboard.
SEQAUTO	PC-C0:14	

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 3-3.

E1

Control mode E1 is commanded by

Abbreviation	**Location** [1]	**Description**
E1		Change from the operator’s keyboard.
SEQE1	PC-C0:15	

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 3-3.

Signal outputs

Abbreviation	**Location** [1]	**Description**
BALOUT	PC-C0:28	Is activated when the control mode is MAN or AUTO. Used,for example, with cascade control to balance the previous controller.
MAN	PC-C0:23	Activated when the control mode is MAN.
AUTO	PC-C0:24	Activated when the control mode is AUTO.
E1	PC-C0:25	Activated when the control mode is E1.

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 3-3.

The signals MAN, AUTO and E1 can be used for control of other PC elements or for external functions, indications etc.

3.3.3 Ratio Algorithm

The main purpose of the block RATIO ALGORITHM is to execute the function algorithm:

Output signal = Measured value * Ratio factor + Bias value

Translated to signal designations, the algorithm becomes:

OUT = MV * WRATIO + BIAS.

The working ratio factor consists of either an internal ratio factor (control mode AUTO) or of an external ratio factor (control mode E1). If required, the ratio factors can be subjected to amplitude limitations in MIN-MAX.

The operator can write in a new value for the internal ratio factor at all times except when the control mode is E1 and tracking is commanded.

Tracking

When tracking is commanded and the control mode is E1, the external ratio factor constitutes both working ratio factor and tracking value for the internal ratio factor. The function is intended to permit bumpless change from control mode E1 to AUTO. The tracking function is controlled with a function parameter (TRACK).

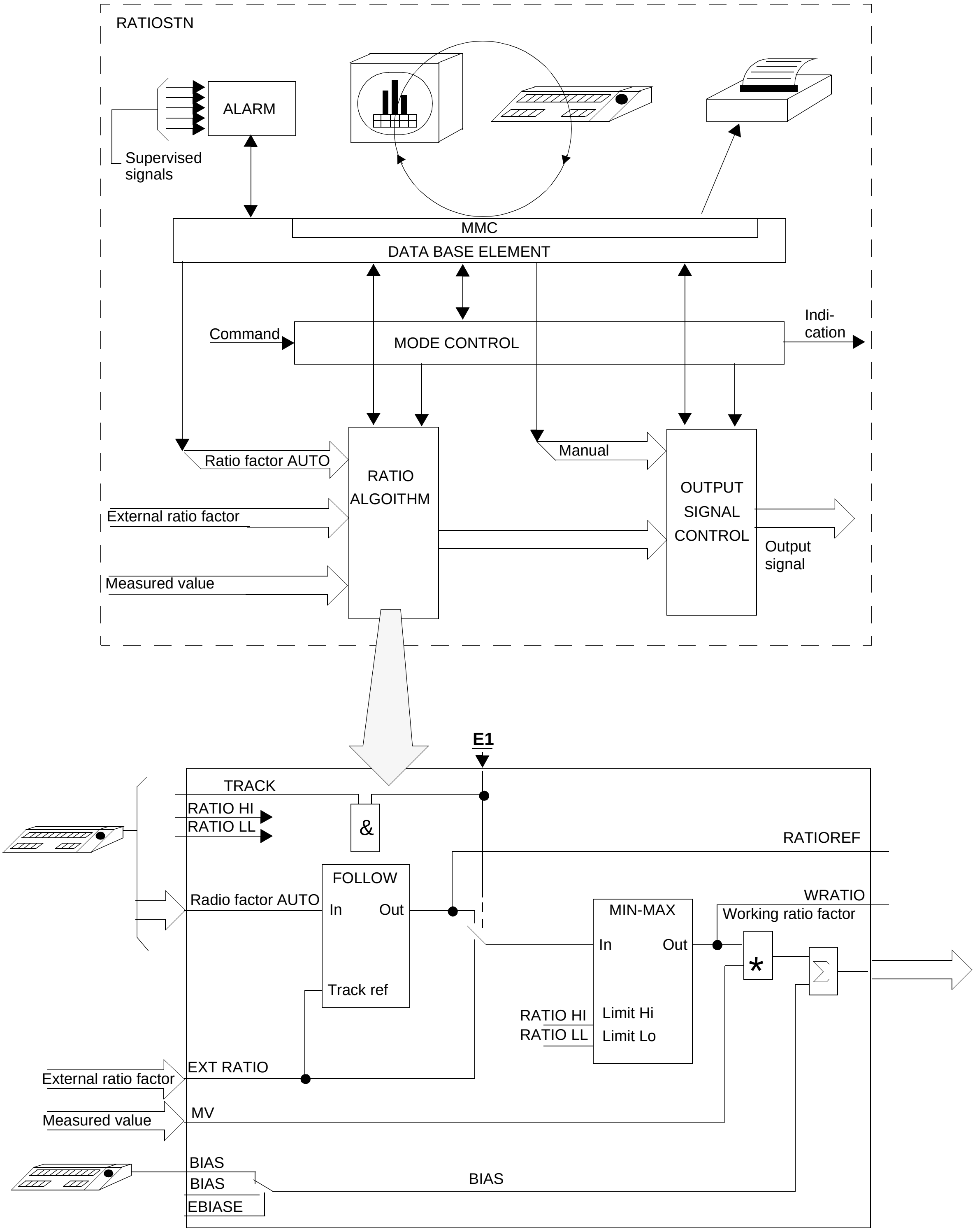


Figure 3-10. Function block RATIO ALGORITHM

Limitations

An upper (RATIO HL) and a lower (RATIO LL) limiting value can be applied to the working ratio factor from the operator's keyboard. The limiting values can be set equal but cannot be crossed. The application of a limitation is indicated.

Signal descriptions

Abbreviation	Location [1]	Description
TRACK	PC-C0:F1	Function parameter for tracking
EXTRATIO	PC-C0:12	External ratio factor
MV	PC-C0:11	Measured value
BIAS	PC-C2:52	Bias value
EBIASE	PC-C2:51	Exchange signal between the operator's keyboard (0) and external signal input (1) for BIAS
RATIOREF	PC-C0:20	Ratio factor with control mode AUTO
WRATIO	PC-C0:21	Working ratio factor.

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 3-3.

3.3.4 Output Signal Control

The following takes place in the block OUTPUT SIGNAL CONTROL:

- Selection of output signal
- Tracking
- Output signal limitation

Selection of output signal

The output signal is selected in accordance with the control mode as follows:

AUTO, E1	A control signal from RATIO ALGORITHM.
MAN	Manual control signal.

Tracking

The signal Manual follows (in accordance with the function block FOLLOW) the control signal from RATIO ALGORITHM in all control modes except MAN.

The tracking function is intended to eliminate abrupt changes in the output signal on change to the control mode MAN.

Output signal limitation

The amplitude of the output signal can be limited in the function block MIN-MAX.

The limitations consist of an upper (OHL) and a lower limitation (OLL).

The limiting values can be determined either from the operator’s keyboard or externally from another PC element or otherwise externally. The exchange is performed with a signal EOLIM.

The operator-entered limiting values are not affected when external limits are used.

The limiting values currently active are presented on the display screen. The application of a limitation is indicated on the display screen and at PC connections.

The limiting values OHL and OLL can be set equal but cannot to be crossed. If the external limiting values are crossed, (i.e. EOLL > EOHL) only the upper value (EOHL) applies and an error indication is presented (OLIMERR).

Signal descriptions

Abbreviation	**Location** [1]	**Description**
EOHL	PC-C2:55	External upper limiting value.
EOLL	PC-C2:54	External lower limiting value.
EOLIM	PC-C2:53	Exchange signal to external limitation (1).
OUT	PC-C0:22	Output signal
OLIMERR	PC-C2:58	Crossed external limiting values.

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 3-3.

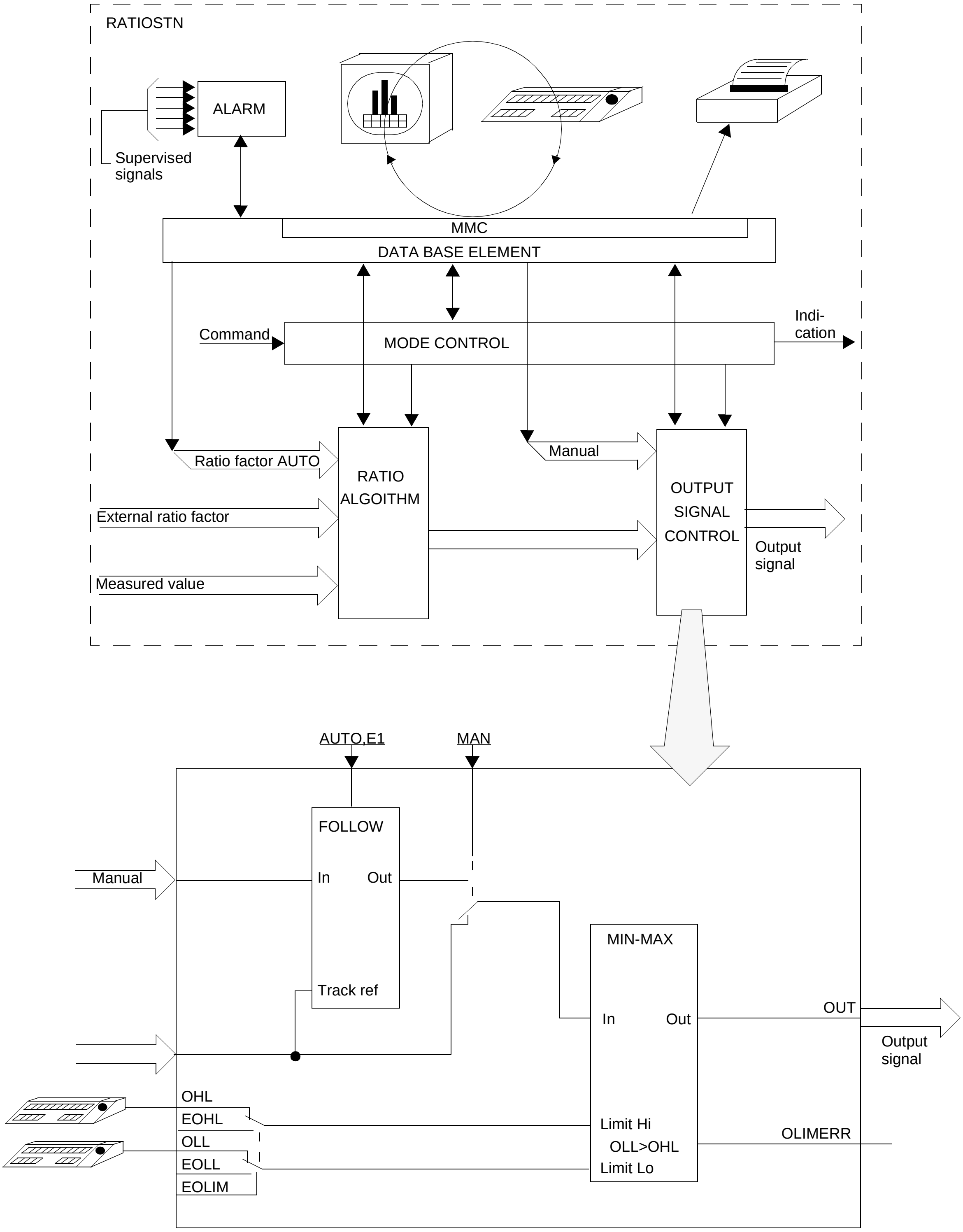


Figure 3-11. Function block, OUTPUT SIGNAL CONTROL

3.3.5 Alarm and Limitation Functions

The function block ALARM monitors the following signals:

- Measured value (MV) with two upper and two lower alarm limits
- Ratio factor AUTO with an upper and a lower limitation
- External ratio factor (EXTRATIO) with an upper and a lower limitation
- Output signal (OUT) with an upper and a lower limitation

On passage of an alarm limit, an alarm is presented on the display screen and printer (if provided). Alarms are also available at outputs on the PC element.

Alarm Limits

When determining the alarm limits, the following rule applies:

$$H2 \geq H1 \geq L1 \geq L2$$

If an attempt is made to cross the alarm limits with each other, the operator is notified that the operation is not permitted. There is no change of the limit.

Alarm Blocking

All supervision of the actual value (MV) can be blocked by activating the connection ALCBLK. The signal outputs are also affected by this blocking (as distinct from operator's blockings which only block display screen and printer).

The event handling function makes it possible to block alarms for error types 1 and 2 from the operator's station or from PC via the data base element.

Type 1 errors include: $MV \geq H1$
$MV \geq L1$

Type 2 errors include: $MV \geq H2$
$MV \geq L2$

This form of alarm blocking means that the printer and display screen and updating of the error list are blocked. The PC outputs are not affected.

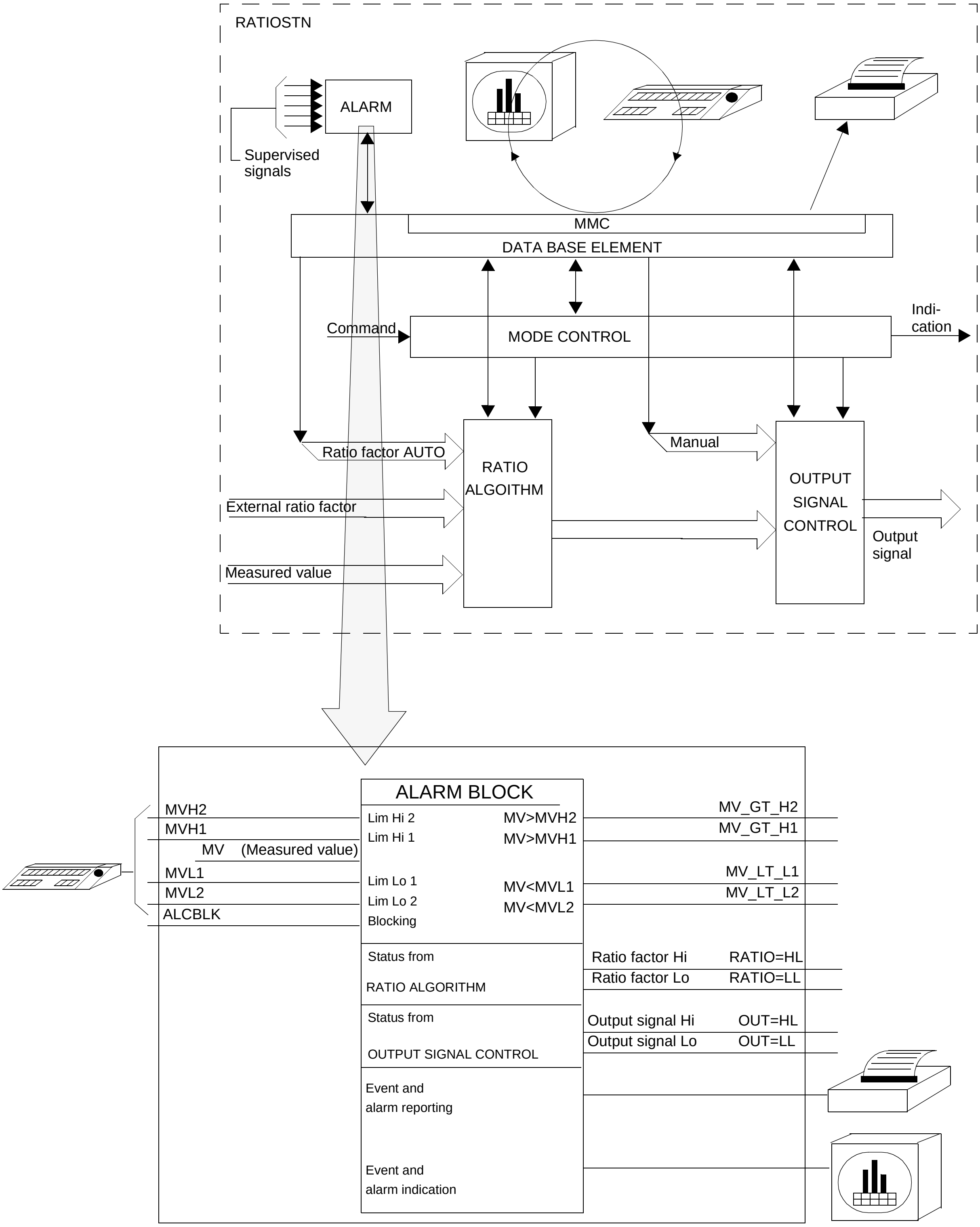


Figure 3-12. Function block, ALARM

Signal Descriptions

Abbreviation	Location [1]	Description
ALCBLK	PC-C1:39	Blocking of alarm on MV
MV_GT_H2	PC-C1:45	Measured value exceeds H2
MV_GT_H1	PC-C1:44	Measured value exceeds H1
MV_LT_L1	PC-C1:43	Measured value less than L1
MV_LT_L2	PC-C1:42	Measured value less than L2
RATIO=HL	PC-C1:41	Ratio factor limitation, high
RATIO=LL	PC-C1:40	Ratio factor limitation, low
OUT=HL	PC-C0:27	Output signal limitation, high
OUT=LL	PC-C0:26	Output signal limitation, low

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 3-3.

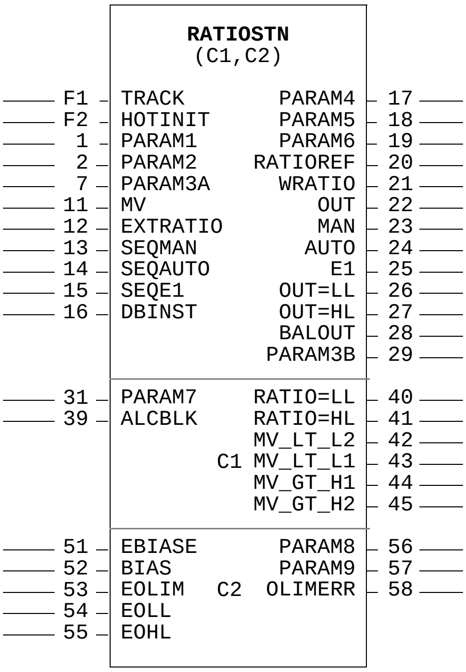
3.4 PC element RATIOSTN

The information about the PC element in the functional unit RATIOSTN, its extension with call parameters and its connection description are given mainly in data sheet form. This data sheet is included in the manual *PC Elements Advant Controller 400 Series Reference Manual* in which all of the PC elements included in the Advant Controller 410/450 products are assembled.

Ratio Station RATIOSTN

Summary

The PC element RATIOSTN forms part of the functional unit RATIOSTN (**RATIO ST**atio**N**). The unit is primarily used with the process controller PIDCON for ratio control. It is used in traditional instrumentation when a VDU based operator station is specified.



PC element RATIOSTN

Call RATIOSTN (C1, C2)

The element consists of one part that forms a basic ratio station. This part may be extended with optional functions with the call parameters C1 and C2 according to the table below.

Parameter	Significance	Permissible values
C1	Selection of ratio limitation and measured value alarm.	0 .. 1
C2	Selection of output signal limitation and external BIAS- setting	0 .. 1

Terminal Description

No	Name	Type	Description
F1	TRACK	II	**TRACK**ing. Function parameter for tracking. 0=tracking. 1=RATIOREF follows EXTRATIO.
F2	HOTINIT	II	**HOT INIT**. Function parameter for warm start, see the HOTINIT table..
1	PARAM1	II	**PARAM**eter **1**. Connection to the data base element (PARAM1).
2	PARAM2	IA24	**PARAM**eter **2**. Connection to the data base element (PARAM2).
7	PARAM3A	II	**PARAM**eter **3A**. Connection to the data base element (PARAM3).
11	MV	IR	**M**easured **V**alue. Input for measured value.
12	EXTRATIO	IR	**EXT**ernal **RATIO**. Input for external ratio.
13	SEQMAN	IB	**SEQ**uential **MAN**ual. Pulse input for ordering of operation mode MAN.
14	SEQAUTO	IB	**SEQ**uential **AUTO**. Pulse input for ordering of operation mode AUTO.
15	SEQE1	IB	**SEQ**uential **E1**. Pulse input for ordering of operation mode E1.
16	DBINST	II	**D**ata **B**ase **INST**ance. An operational parameter or a constant, defining the instance number of the data base (to be found in its header). Alternatively, a connection to the data base element.
17	PARAM4	OI	**PARAM**eter **4**. Connection to the data base element (PARAM4).
18	PARAM5	OI	**PARAM**eter **5**. Connection to the data base element (PARAM5)
19	PARAM6	OA24	**PARAM**eter **6**. Connection to the data base element (PARAM6).
20	RATIOREF	OR	**RATIO REF**erence. Output for ratio reference with operation mode AUTO.
21	WRATIO	OR	**W**orking **RATIO**.
22	OUT	OR	**OUT**put. Output signal.
23	MAN	OB	**MAN**ual. Output for indication of operation mode MAN.
24	AUTO	OB	**AUTO**. Output for indication of operation mode AUTO.
25	E1	OB	Output for indication of operation mode E1.
26	OUT=LL	OB	**OUT**put=**L**ow **L**imit. Output for indication of output signal limiting. It is set to 1 when the output signal has been limited to the lower limit value.

Terminal Description

No	Name	Type	Description
27	OUT=HL	OB	**OUT**put=**H**igh **L**imit. Output for indication of output signal limiting. It is set to 1 when the output signal has been limited to the upper limit value.
28	BALOUT	OB	**BAL**ance **OUT**. Output for indication of operation mode MAN or AUTO.
29	PARAM3B	OI	**PARAM**eter **3B**. Connection to the data base element (PARAM3). Acknowledgement of switching of operation mode by the operator.
31(1)	PARAM7	IA32	**PARAM**eter **7**. Connection to the data base element (PARAM7).
39(1)	ALCBLK	IB	**AL**arm **C**ontrol **BL**oc**K**. Input for blocking of limit value alarm.
40(1)	RATIO=LL	OB	**RATIO**=**L**ow **L**imit. Output which is set to 1 when the ratio is limited by the lower limit.
41(1)	RATIO=HL	OB	**RATIO**=**H**igh **L**imit. Output which is set to 1 when the RATIO is limited by upper limit.
42(1)	MV_LT_L2	OB	**M**easured **V**alue_**LT**_**L**ow **2**. Output which is set to 1 when the measured value falls below the alarm limit L2.
43(1)	MV_LT_L1	OB	**M**easured **V**alue_**LT**_**L**ow **1**. Output which is set to 1 when the measured value falls below the alarm limit L1.
44(1)	MV_GT_H1	OB	**M**easured **V**alue_**GT**_**H**igh **1**. Output which is set to 1 when the measured value exceeds the alarm limit H1.
45(1)	MV_GT_H2	OB	**M**easured **V**alue_**GT**_**H**igh **2**. Output which is set to 1 when the measured value exceeds the alarm limit H2.
51(2)	EBIASE	IB	**E**xternal **BIAS E**nable. Input for selection of bias. 0=value from the operator's keyboard 1=value from the external input BIAS.
52(2)	BIAS	IR	Input for BIAS.
53(2)	EOLIM	IB	**E**xternal **O**utput **LIM**it. Input for selection of external limit values for the output signal.
54(2)	EOLL	IR	**E**xternal **O**utput **L**ow **L**imit. External lower limit value for the output signal.
55(2)	EOHL	IR	**E**xternal **O**utput **H**igh **L**imit. External upper limit value for the output signal.
56(2)	PARAM8	OA8	**PARAM**eter **8**. Connection to the data base element (PARAM8).
57(2)	PARAM9	OR	**PARAM**eter **9**. Connection to the data base element (PARAM9)
58(2)	OLIMERR	OB	**O**utput **LIM**it **ERR**or. Output which is set to 1 when EOLL>EOHL.

(1) These connection are available only if the call parameter C1 is set to 1.
(2) These connection are available only if the call parameter C2 is set to 1.

HOTINIT

	Function with warm start	
HOTINIT	**Operation mode**	**Output signal**
0	unchanged	unchanged
1	MAN	unchanged

HOTINIT

	Function with warm start	
HOTINIT	**Operation mode**	**Output signal**
2	MAN	0 or OLL
By unchanged is meant no change in relation to the state in effect before the event that caused the warm start.		

3.4.1 Connections to Data Base Elements

The following connections are made in the PC program to transfer information between PC element and data base elements.

Table 3-1. Connections to data base elements

No	Name	Terminal in the data base element
1	PARAM1	PARAM1
2	PARAM2	PARAM2
7	PARAM3A	PARAM3
16	DBINST	Either DB=NAME or D=INSTANCE NUMBER of data base element
17	PARAM4	PARAM4
18	PARAM5	PARAM5
19	PARAM6	PARAM6
22	OUT	POUT
29	PARAM3B	PARAM3

If C1 = 1, in addition,

31	PARAM7	PARAM7

In addition, the measured value input MV is connected to I/O in the normal manner.

3.5 Data Base Element RATIOSTN

Information about the data base element in the functional unit RATIOSTN is given in data sheet form. This data sheet is included in the manual *Data Base Elements Advant Controller 400 Series Reference Manual* in which all of the data base elements included in the Advant Controller 410/450 products are assembled.

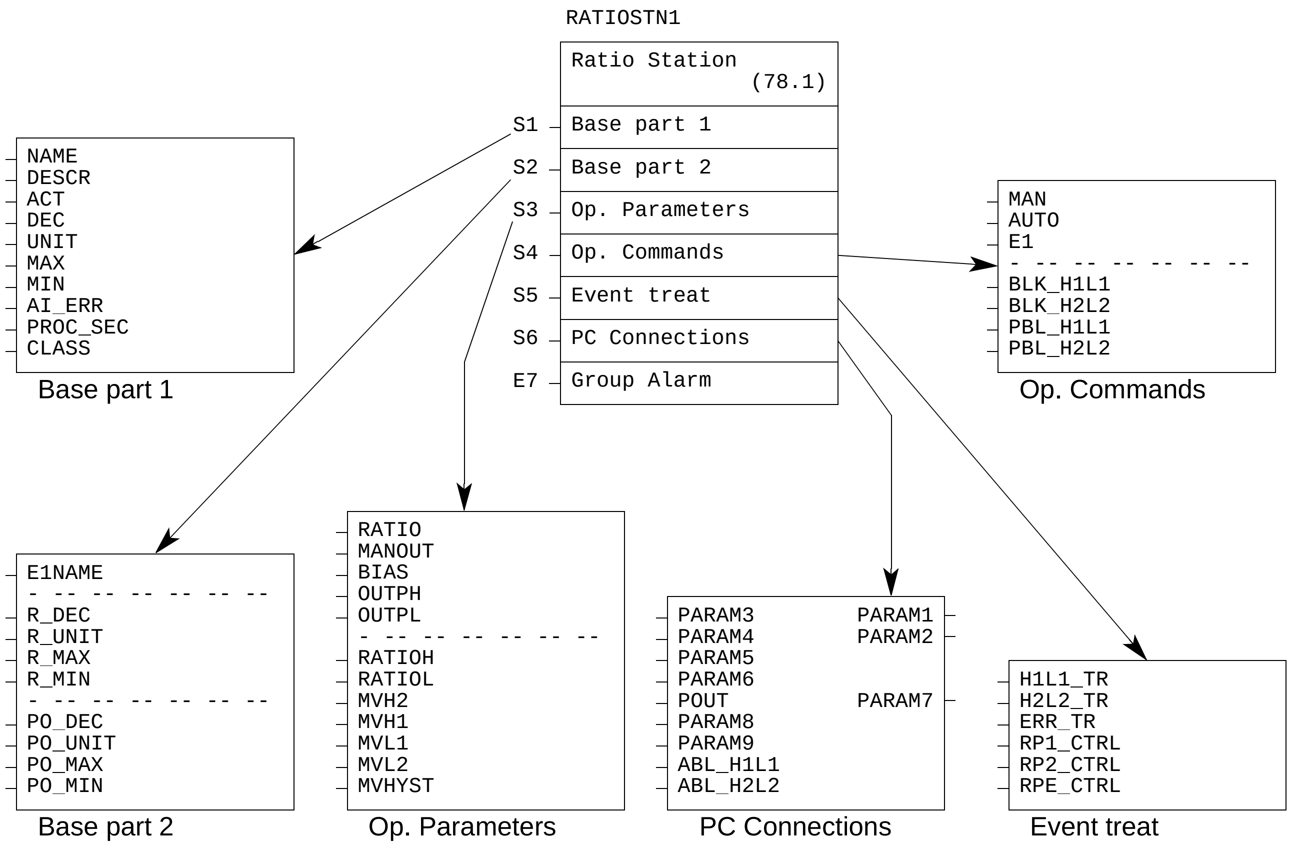
Ratio Station RATIOSTN

Summary

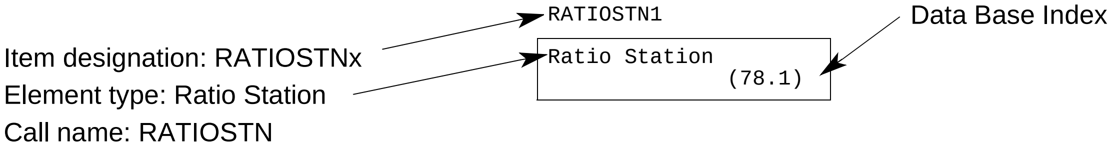
The Ratio Station data base element is used to build up Advant Station 500 Series Operator Station functions for the RATIOSTN functional unit. Some static information in the displays can be given. Parameters which can be changed from the dialog can be given start values. The element performs an interface between the PC-program/process function and Advant Station 500 Series Operator Station.

For information about the extension parts of Group Alarm see data base element Group Member.

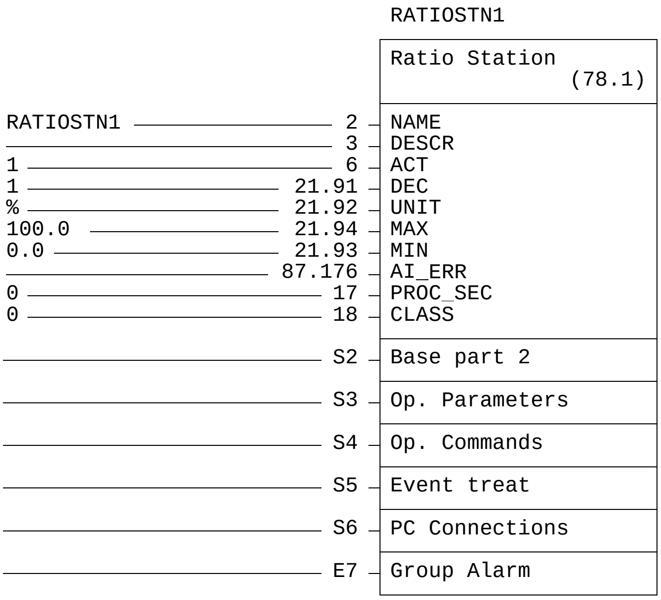
Overview


RATIOSTN1
Ratio Station
(78.1)
S1 Base part 1
S2 Base part 2
S3 Op. Parameters
S4 Op. Commands
S5 Event treat
S6 PC Connections
E7 Group Alarm
NAME
DESCR
ACT
DEC
UNIT
MAX
MIN
AI_ERR
PROC_SEC
CLASS
Base part 1
MAN
AUTO
E1
BLK_H1L1
BLK_H2L2
PBL_H1L1
PBL_H2L2
Op. Commands
E1NAME
R_DEC
R_UNIT
R_MAX
R_MIN
PO_DEC
PO_UNIT
PO_MAX
PO_MIN
Base part 2
RATIO
MANOUT
BIAS
OUTPH
OUTPL
RATIOH
RATIOL
MVH2
MVH1
MVL1
MVL2
MVHYST
Op. Parameters
PARAM3
PARAM4
PARAM5
PARAM6
POUT
PARAM8
PARAM9
ABL_H1L1
ABL_H2L2
PARAM1
PARAM2
PARAM7
PC Connections
H1L1_TR
H2L2_TR
ERR_TR
RP1_CTRL
RP2_CTRL
RPE_CTRL
Event treat

Head



Base part 1



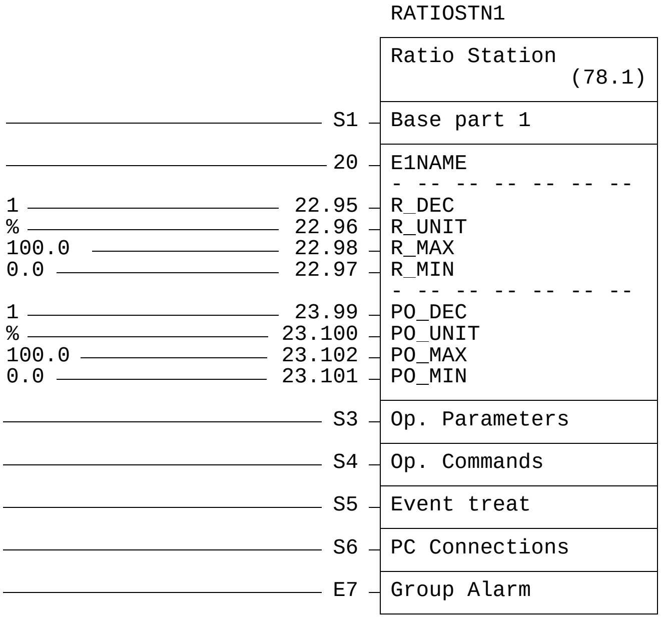
Terminal Description, Base part 1

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
2	NAME	user	RATIO STNx	–	Each Ratio Station must have a unique **NAME**. E.g. YY101.	Max. 20 characters. Spaces are not allowed.
3	DESCR	user	–	–	This **DESCR**iption of the Ratio Station will be shown in Operator Station.	Max. 20 characters. You may enter any information regarding the controller.
6	ACT	user	1	B(r/w)	1=operator communication is **ACT**ive.	0=dialog is blocked and events are not updated.

Terminal Description, Base part 1 (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
21.91	DEC	user	1	–	The number of **DEC**imals for measured value and its alarm limits.	A total number of 5 figures plus point and sign can be presented. 0..6 decimals.
21.92	UNIT	user	%	A6(r)	The **UNIT** of the measured value in engineering unit.	Max. 6 characters shown in Operator Station and data base element.
21.94	MAX	user	100.0	R(r/w)	**MAX**imum value within measuring range.	Used for scaling of bar graph.
21.93	MIN	user	0.0	R(r/w)	**MIN**imum value within measuring range.	Used for scaling of bar graph.
87.176	AI_ERR	user	–	–	**AI_ERR**or. Reference to the Analog Input element which is used for the measured value.	Connects error flag in the analog input to RATIOSTN. E.g. YY 101. Change is carried out at next system init.
17	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
18	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station	–

Base part 2



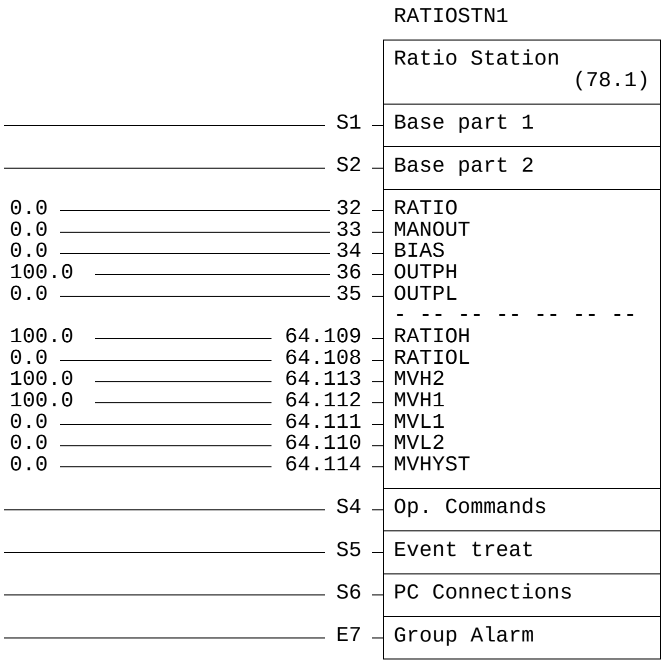
Terminal Description, Base part 2

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
20	E1NAME	user	–	–	**NAME** of **E**xternal reference.	The text entered here will be presented in the object display under ”CONTROL MODE”.
22.95	R_DEC	user	1	A6(r)	The number of **DEC**imals for presentation of **R**atio factor.	A total number of 5 figures plus point and sign can be presented. 0..6 decimals.
22.96	R_UNIT	user	%	R(r/w)	The **UNIT** for the **R**atio factor in engineering unit.	Max. 6 characters shown in Operator Station and data base element.
22.98	R_MAX	user	100.0	R(r/w)	**MAX**imum **R**atio factor.	Used for dimensioning of INC/DEC step.
22.97	R_MIN	user	0.0	R(r/w)	**MIN**imum **R**atio factor.	Used for dimensioning of INC/DEC step.
23.99	PO_DEC	user	1	–	The number of **DEC**imals for **P**rocess **O**utput value presentation.	A total number of 5 figures plus point and sign can be presented. 0..6 decimals.

Terminal Description, Base part 2 (Continued)

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
23.100	PO_UNIT	user	%	A6(r)	The **UNIT** of the **P**rocess **O**utput value in engineering unit.	Max. 6 characters shown in Operator Station and data base element.
23.102	PO_MAX	user	100.0	R(r/w)	**MAX**imum **P**rocess **O**utput value.	Used for dimensioning of INC/DEC step.
23.101	PO_MIN	user	0.0	R(r/w)	**MIN**imum **P**rocess **O**utput value.	Used for dimensioning of INC/DEC step. Used for dimensioning of INC/DEC step.

Operators Parameters



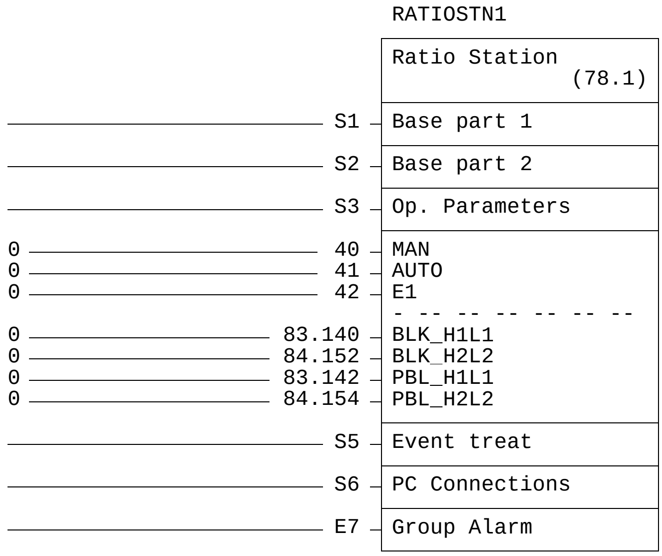
Terminal Description, Operators Parameters

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
32	RATIO	dialog	0.0	R(r/w)	**RATIO** factor in AUTO mode.	Unit acc. to R_UNIT.
33	MANOUT	dialog	0.0	R(r/w)	**MAN**ual **OUT**put.	Unit acc. to PO_UNIT.
34	BIAS	dialog	0.0	R(r/w)	**BIAS** factor.	Unit acc. to PO_UNIT.
36	OUTPH	dialog	100.0	R(r/w)	**OUTP**ut **H**igh limit.	Unit acc. to PO_UNIT.
35	OUTPL	dialog	0.0	R(r/w)	**OUTP**ut **L**ow limit.	Unit acc. to PO_UNIT.
64.109	RATIOH	dialog	100.0	R(r/w)	**H**igh limit of **RATIO** factor.	Unit acc. to R_UNIT.
64.108	RATIOL	dialog	0.0	R(r/w)	**L**ow limit of **RATIO** factor.	Unit acc. to R_UNIT.
64.113	MVH2	dialog	100.0	R(r/w)	Alarm limit **H2** of **M**easured **V**alue.	Unit acc. to UNIT.
64.112	MVH1	dialog	100.0	R(r/w)	Alarm limit **H1** of **M**easured **V**alue.	Unit acc. to UNIT.
64.111	MVL1	dialog	0.0	R(r/w)	Alarm limit **L1** of **M**easured **V**alue.	Unit acc. to UNIT.
64.110	MVL2	dialog	0.0	R(r/w)	Alarm limit **L2** of **M**easured **V**alue.	Unit acc. to UNIT.

Terminal Description, Operators Parameters (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
64.114	MVHYST	user	0.0	R(r/w)	**HYST**eresis for alarm limits of **M**easured **V**alue.	Unit acc. to UNIT.

Operators Commands



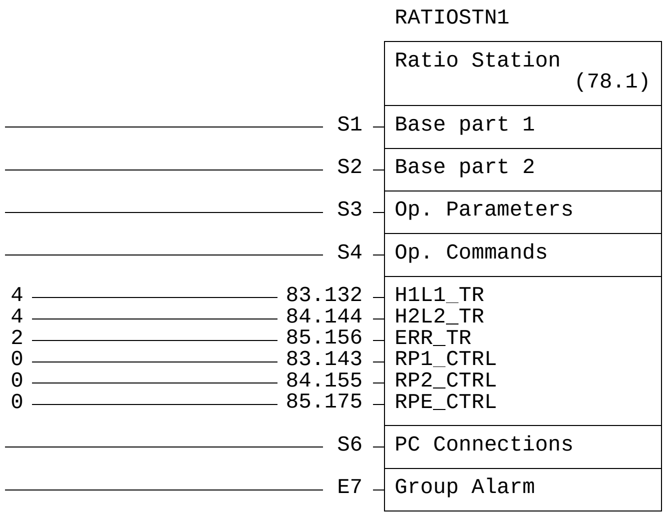
Terminal Description, Operators Commands

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
40	MAN	dialog	0	B(r/w)	**MAN**ual mode.	Converted to pulse by the system.
41	AUTO	dialog	0	B(r/w)	**AUTO**matic mode.	Converted to pulse by the system.
42	E1	dialog	0	B(r/w)	**E**xternal mode 1.	Converted to pulse by the system.
83.140	BLK_H1L1	dialog	0	–	**BL**oc**K**ing of alarms **H1** and **L1**.	–
84.152	BLK_H2L2	dialog	0	–	**BL**oc**K**ing of alarms **H2** and **L2**.	–
83.142	PBL_H1L1	dialog	0	–	**BL**oc**K** **P**rinter for **H1** and **L1** alarms. Blocking of printer for H1 and L1 alarms.	–

Terminal Description, Operators Commands (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
84.154	PBL_H2L2	dialog	0	–	**BL**oc**K** **P**rinter for **H2** and **L2** alarms. Blocking of printer for H2 and L2 alarms.	–

Event treat



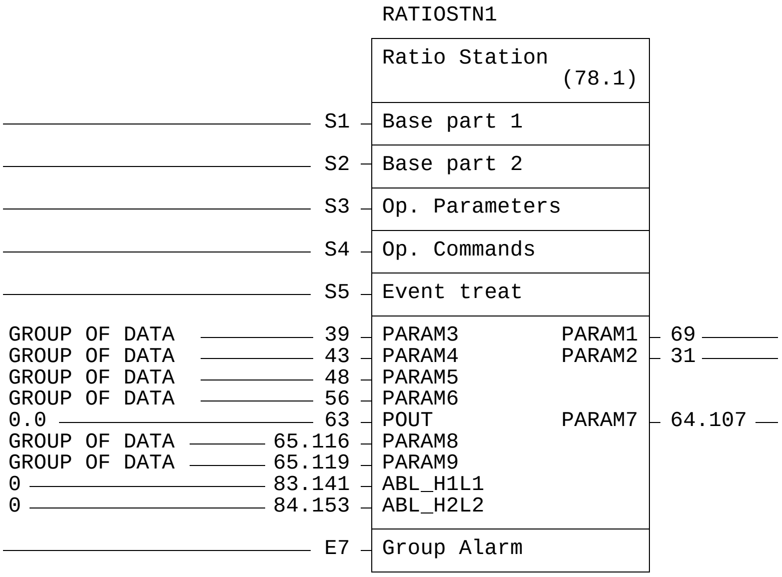
Terminal Description, Event treat

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
83.132	H1L1_TR	user	4	–	Alarm **H1** and **L1** **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of the alarms H1 and L1.	–
84.144	H2L2_TR	user	4	–	Alarm **H2** and **L2** **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of the alarms H2 and L2.	–
85.165	ERR_TR	user	2	–	**ERR**or **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of signal error in the analog input connected to the ratio station.	–

Terminal Description, Event treat (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
83.143	RP1_CTRL	user	0	–	**R**e**P**eat fail **C**on**TR**o**L** for alarms H**1** and L**1**. Blocking of repeating H1 and L1 alarms.	–
84.155	RP2_CTRL	user	0	–	**R**e**P**eat fail **C**on**TR**o**L** for alarms H**2** and L**2**. Blocking of repeating H2 and L2 alarms.	–
85.175	RPE_CTRL	user	0	–	**R**e**P**eat fail **C**on**TR**o**L** for signal **E**rror. Blocking of repeating signal error in the analog input connected to the ratio station.	–

PC Connections



Terminal Description, PC Connections

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
39	PARAM3	PC	–	I(r/w)	Group of data to be connected to the PC element connections **PARAM3**A and **PARAM3**B.	–
43	PARAM4	PC	–	I(r/w)	Group of data to be connected to the PC element connection **PARAM4**.	–
48	PARAM5	PC	–	I(r/w)	Group of data to be connected to the PC element connection **PARAM5**.	–
56	PARAM6	PC	–	A24 (r/w)	Group of data to be connected to the PC element connection **PARAM6**.	–
63	POUT	PC	0.0	R(r/w)	To be connected to the PC element connection **OUT**. (For display purposes.)	–
65.116	PARAM8	PC	–	A8(r/w)	Group of data to be connected to the PC element connection **PARAM 8** if C2=1.	–
65.119	PARAM9	PC	–	R(r/w)	Group of data to be connected to the PC element connection **PARAM9** if C2=1.	–
83.141	ABL_H1L1	PC	0	B(r/w)	**A**uto **BL**ock alarms **H1** and **L1**.	See section Application Example in the functional unit manual.
84.153	ABL_H2L2	PC	0	B(r/w)	**A**uto **BL**ock alarms **H2** and **L2**.	See section Application Example in the functional unit manual.
69	PARAM1	system	–	I(r/w)	Group of data to be connected to the PC element connection **PARAM1**.	–
31	PARAM2	system	–	A24(r/w)	Group of data to be connected to the PC element connection **PARAM2**.	–
64.107	PARAM7	system	–	A32(r/w)	Group of data to be connected to the PC element connection **PARAM7** if C1=1.	–

3.6 Operator Functions

The operator functions are divided in principle into 3 parts:

- Presentation (Display elements, Time logged properties)
- Dialog
- Event handling

3.6.1 Presentation

Display elements which can be used for different display types are available for use in the functional unit RATIOSTN.

The display elements show the status and the controls of the process with different degrees of detail and is intended for the following displays:

- Object display
- Group display
- Object closeup display
- Process display

Examples of different display elements which could be used in these displays are given in the following section. A complete list of the prepared elements available is provided in the manual *AdvaCommand User Interface Reference Manual*.

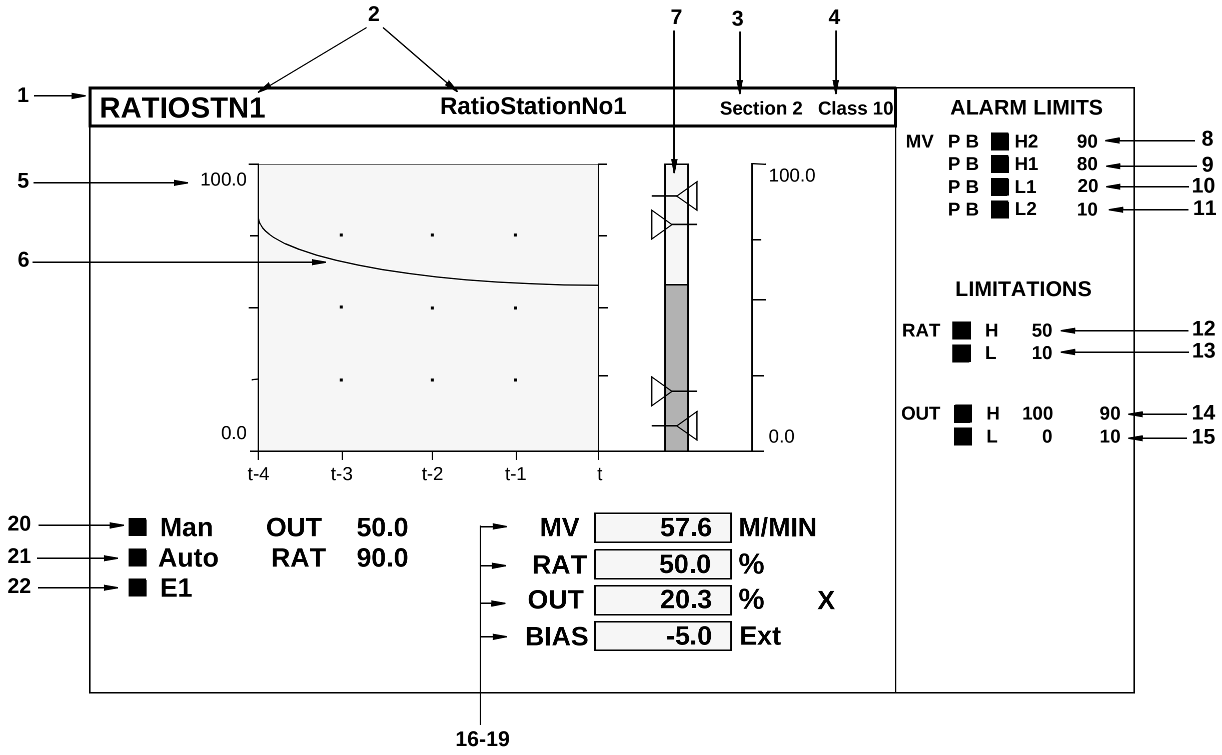
Detailed information about alternative ways of presenting certain status and data within the displays such as color, flashing, blocked etc. is given in the reference manual.

Time-logged Properties

For RATIOSTN, the following measured values can be logged and presented in this way:

MV	Measured Value
RAT	Ratio
OUT	OUTput signal.

Object display: RATOB01



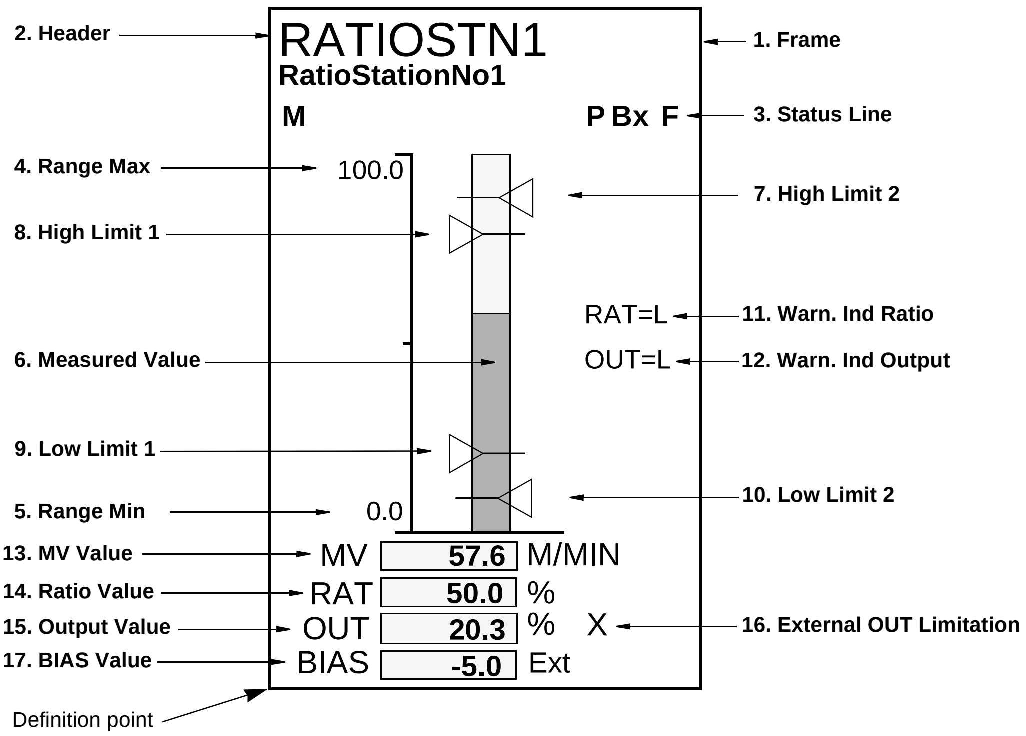
No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3.1	Section Text	
3.2	Section Value	Object section
4.1	Class Text	
4.2	Class Value	Object class
5	Range Max	Range Max of the MV value
	Range Min	Range Min of the MV value
6	Measured Value Trim Curve	Object measure value
7.1	Measured Value Bargraph	
7.2	High Limit 2	Alarm High limit 2
7.3	High Limit 1	Warning High limit 1
7.4	Low Limit 1	Warning Low limit 1
7.5	Low Limit 2	Alarm Low limit 2

No	Description	Remarks
8	ALARM LIMITS for MV	
8.1	MV Text	
8.2	Printout blocked	
8.3	Alarm blocked	
8.4	Alarm Indication	Alarm High limit 2
8.5	H2 Text	
8.6	H2 Value	High limit 2 value
9.1	Printout blocked	
9.2	Alarm blocked	
9.3	Warning Indication	
9.4	H1 Text	
9.5	H1 Value	High limit 1 value
10.1	Printout blocked	
10.2	Alarm blocked	

No	Description	Remarks
10.3	Warning Indication	
10.4	L1 Text	
10.5	L1 Value	Low limit 1 value
11.1	Printout blocked	
11.2	Alarm blocked	
11.3	Alarm Indication	
11.4	L2 Text	
11.5	L2 Value	Low limit 1 value
12	LIMITATIONS for RAT	
12.1	RAT Text	Ratio value
12.2	Warning Indication	
12.3	H Text	
12.4	H Value	
13.1	Warning Indication	
13.2	L Text	
13.3	L Value	Ratio Low value
14	LIMITATIONS for OUT	
14.1	OUT Text	
14.2	Warning Indication	
14.3	H Text	
14.4	H Value	Output High value
14.5	External H value	Extern Output High value
15.1	Warning Indication	Warning Output Low
15.2	L Text	
15.3	L Value	Extern Output Low value

No	Description	Remarks
15.4	External L value	Extern Output Low value
16.1	MV Text	
16.2	MV Value	Measured value
16.3	MV Unit	
17.1	RAT Text	
17.2	RAT Value	Ratio value
17.3	RAT Unit	
18.1	OUT Text	
18.2	OUT Value	Output value
18.3	OUT Unit	
18.4	External OUT Limitation	Object extern output limit
19.1	BIAS Text	
19.2	BIAS Value	
19.3	BIAS Unit	
20.1	Man Indication	Manual mode
20.2	Man Text	
20.3	Man Out Text	
20.4	Man Out Value	
21.1	Auto Indication	Auto mode
21.2	Auto Text	
21.3	Auto Ratio Text	
21.4	Auto Ratio Value	
22.1	E1 Indication	E1 mode
22.2	E1 Text	
22.3	E1 Name	

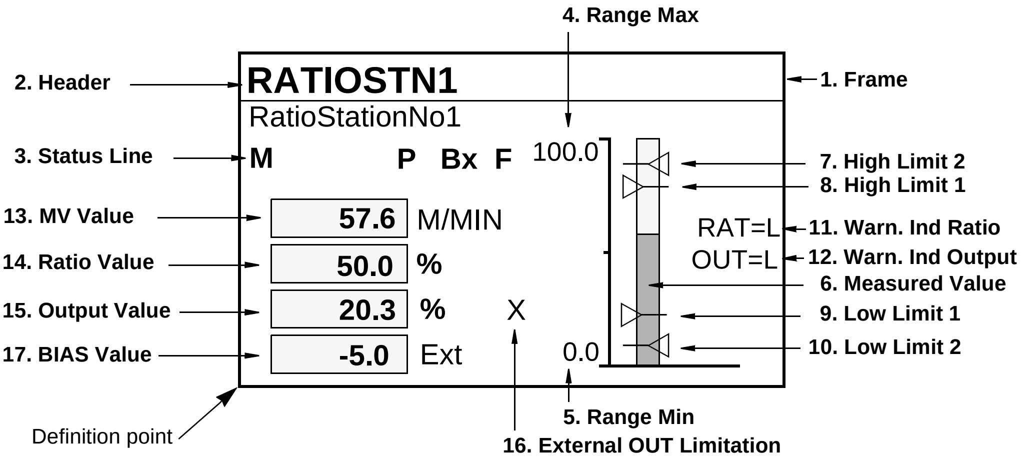
Display Element for Group display: RATGR01



No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	
3.2	Printout Blocked	
3.3	Alarm Blocked	
3.4	Alarm Indication	
4	Range Max	Range Max of the MV value
5	Range Min	Range Min of the MV value
6	Measured Value Bargraph	
7	High Limit 2	Alarm High limit 2
8	High Limit 1	Warning High limit 1
9	Low Limit 1	Warning Low limit 1
10	Low Limit 2	Alarm Low limit 2
11	Warning Indication Ratio	
12	Warning Indication Outrput	

No	Description	Remarks
13	Measured Value	MV object value
13.1	MV	
13.2	MV Value	
13.3	MV Unit	
14	Ratio Value	RAT object value
14.1	RAT	
14.2	RAT Value	
14.3	RAT Unit	
15	Output Value	OUT object value
15.1	OUT	
15.2	OUT Value	
15.3	OUT Unit	
16	Extern OUT Limitation	
17.1	BIAS Value	BIAS object value
17.2	BIAS Value	
17.3	BIAS Unit	

Display Element for Object closeup display: RATWI01

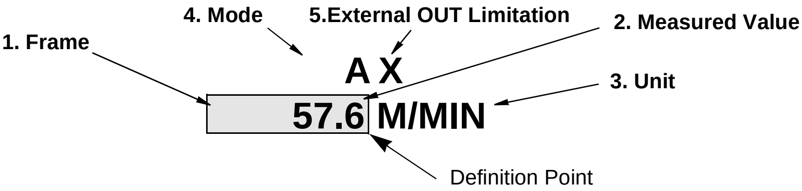


No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	
3.2	Printout Blocked	
3.3	Alarm Blocked	
3.4	Alarm Indication	
4	Range Max	Range Max of the MV value
5	Range Min	Range Min of the MV value
6	Measured Value Bargraph	
7	High Limit 2	Alarm High limit 2
8	High Limit 1	Warning High limit 1
9	Low Limit 1	Warning Low limit 1
10	Low Limit 2	Alarm Low limit 2
11	Warning Indication Ratio	

No	Description	Remarks
12	Warning Indication Outrput	
13	Measured Value	MV object value
13.1	MV Value	
13.2	MV Unit	
14	Ratio Value	RAT object value
14.1	RAT Value	
14.2	RAT Unit	
15	Output Value	OUT object value
15.1	OUT Value	
15.2	OUT Unit	
16	Extern OUT Limitation	
17	BIAS Value	BIAS object value
17.1	BIAS Value	
17.2	BIAS Unit	

Display Element for Process display:

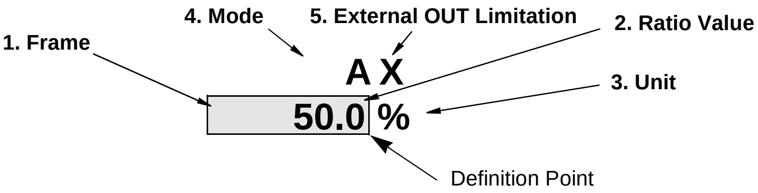
RATPD01



No	Description	Remarks
1	SelectFrame	
2	Measured Value	
3	Unit	

No	Description	Remarks
4	Mode	
5	External OUT Limitation	

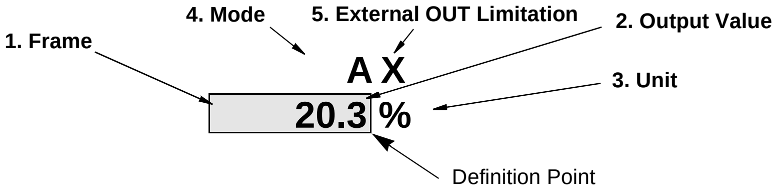
RATPD02



No	Description	Remarks
1	SelectFrame	
2	Ratio Value	
3	Unit	

No	Description	Remarks
4	Mode	
5	External OUT Limitation	

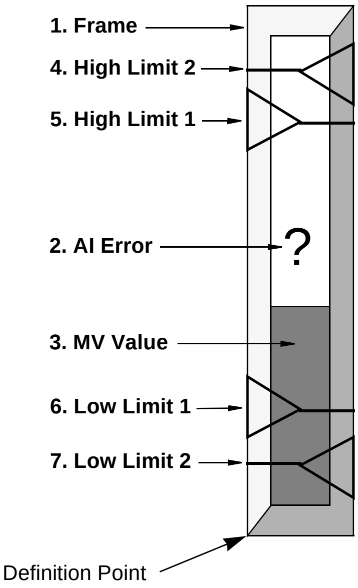
RATPD03



No	Description	Remarks
1	SelectFrame	
2	Output Value	
3	Unit	

No	Description	Remarks
4	Mode	
5	External OUT Limitation	

RATPD51



No	Description	Remarks
1.1	SelectFrame	Object frame
1.2	TopLeftEdge	
1.3	BottomRoghtEdge	
2	AI error	
3	Measured Value	

No	Description	Remarks
4	High Limit 2	Alarm High limit 2
5	High Limit 1	Warning High limit 1
6	Low Limit 1	Warning Low limit 1
7	Low Limit 2	Alarm Low limit 2

3.6.2 Dialog

The display screen is supplemented with a keyboard for operator communication with the functional unit/object.The dialog is built up using both fixed and dynamic keys. The functions available with the dynamic keys are presented in a pattern of rectangles on the lower part of the display screen when the object is selected. The functional unit RATIOSTN has a MIN dialog (Production level) and a MAX dialog (Maintenance level).

The MIN dialog consists of an output dialog with 1 subdialog. The MAX dialog consists of an output dialog with 3 subdialogs.

MIN dialog (No authority key)

Keyboard keys

+ ↑	**Increase**	Increase output value with 0.5%
⇧ Shift + (+ ↑)		Increase output value with 5.0%
↓ −	**Decrease**	Decrease output value with 0.5%
⇧ Shift + (↓ −)		Decrease output value with 5.0%
Man	**Man**	Set to manual mode
Auto	**Auto**	Set to automatic mode
E1	**E1**	Set to external1 mode
✓	**Acknowledge**	Acknowledge alarm
Object	**Object Display**	Select Object Display
📈	**Object Trend**	Select Object Trend
Dialog	**Previous Level**	Select Top Level dynamic keys

Dynamic keys, Top Level

D1	D2	D3	D4	D5
D6 OUT	D7 RAT	D8	D9	D10 *Keyboard…*

OUT	Check/change output value
RAT	Check/change ratio value
Keyboard…	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard

D1 ↑ Increase	D2 Man	D3 Auto	D4 E1	D5
D6 ↓ Decrease	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Increase	Increase output value with 0.5%
Shift + Increase	Increase output value with 5.0%
Man	Set to manual mode
Auto	Set to automatic mode
E1	Set to external1 mode
Decrease	Decrease output value with 0.5%
Shift + Decrease	Decrease output value with 5.0%
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

MAX dialog (Authority key)

Keyboard keys

+ ↑	**Increase**	Increase output value with 0.5%
⇧ Shift **+** + ↑		Increase output value with 5.0%
↓ −	**Decrease**	Decrease output value with 0.5%
⇧ Shift **+** ↓ −		Decrease output value with 5.0%
Man	**Man**	Set to manual mode
Auto	**Auto**	Set to automatic mode
E1	**E1**	Set to external1 mode
✓	**Acknowledge**	Acknowledge alarm
Object	**Object Display**	Select Object Display
📈	**Object Trend**	Select Object Trend
Dialog	**Previous Level**	Select Top Level dynamic keys
Dialog	**Next Block**	Page between the subdialogs

Dynamic keys, Top Level

D1	D2	D3	D4 *Block…*	D5 *Limits…*
D6 OUT	D7 RAT	D8 BIAS	D9	D10 *Keyboard…*

Block…	Select Dynamic keys: Block
Limits…	Select Dynamic keys: Limits
OUT	Check/change output value
RAT	Check/change ratio value
BIAS	Check/change bias value
Keyboard…	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard

D1 ↑ Increase	D2 Man	D3 Auto	D4 E1	D5 E2
D6 ↓ Decrease	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Increase	Increase output value with 0.5%
Shift + Increase	Increase output value with 5.0%
Man	Set to manual mode
Auto	Set to automatic mode
E1	Set to external1 mode
Decrease	Decrease output value with 0.5%
Shift + Decrease	Decrease output value with 5.0%
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

Dynamic keys, Block…

D1 Block Alarm 1	D2 Block Printout 1	D3	D4 Block Alarm 2	D5 Block Printout 2
D6 Deblock Alarm 1	D7 Deblock Printout 1	D8	D9 Deblock Alarm 2	D10 Deblock Printout 2

Block Alarm 1	Block alarm 1 indication
Block Printout 1	Block event 1 printout
Block Alarm 2	Block alarm 2 indication
Block Printout 2	Block event 2 printout
Deblock Alarm 1	Deblock alarm 1 indication
Deblock Printout 1	Deblock event 1 printout
Deblock Alarm 2	Deblock alarm 2 indication
Deblock Printout 2	Deblock event 2 printout

Dynamic keys, Limits…

D1 H1 80.00	D2 H2 90.00	D3 RAT H 50.00	D4	D5 OUT H 100.00
D6 L1 20.00	D7 L2 10.00	D8 RAT L 10.00	D9	D10 OUT L 0.00

H1	Check/change measured value warning limit H1
H2	Check/change measured value alarm limit H2
RAT H	Check/change upper warning limit ratio value
OUT H	Check/change upper warning limit output
L1	Check/change measured value warning limit L1
L2	Check/change measured value alarm limit L2
RAT L	Check/change lower warning limit ratio value
OUT L	Check/change lower warning limit output

3.6.3 Event Handling

This chapter contains a description of all alarms and events in the functional unit RATIOSTN.

All these alarms and events are divided into groups. For each of these groups, there is an EVENT_TREAT pointer in the data base element. This pointer indicates a data base element of type EVENT_TREAT in Advant Station 500 Series Operator Station where the processing of the events of the group is defined. In the table on the next page, the allocation of pointers to the different events and alarms is set out, which are defined for PIDCON. The table also shows the standard texts obtained in the event and alarm messages and the pointer numbers to user-defined texts in the EVENT_TREAT element indicated. The latter is of interest in case the standard texts are not suitable. The different event groups are described below.

Events of type 1 include passage of alarm limits L1, H1. An alarm is registered in the alarm list and event list when an error status is detected and in the event list when it is corrected. The event handling in operator station can be blocked with the dialog (BLK H1/L1 or by applying a logic signal 1 at the PC input ALCBLK in RATIOSTN, or by applying a logical ’1’ to the input ABL_H1L1 on the data base element.

Events of type 2 include passage of alarm limits L2, H2. An alarm is registered in the alarm list and event list when an error status is detected and in the event list when it is corrected. The event handling can be blocked with the dialog BLK H2/L2 or by applying the logical signal 1 at the PC input ALCBLK in RATIOSTN, or by applying a logical ’1’ to the input ABL_H2L2 on the data base element.

Events of type 4 are only errors in the measured value, AI-ERROR. An alarm is registered in the alarm list and event list when an error status is detected and in the event list when it is corrected. The event handling cannot be blocked.

Table 3-2. Event Texts for RATIOSTN

Events	**Event Treat pointer**	**Property text**		**Event text**	
		Standard text	**Line No in Event Treat**	**Standard text**	**Line No in Event Treat**
Lower limit L1 for measured value exceeded	H1L1_TR	MV<L1	1	<Value> <Unit>	1
Lower limit L1 for measured value re-entered	H1L1_TR	MV<L1	1	<Value> <Unit>	2
Upper limit H1 for measured value exceeded	H1L1_TR	MV>H1	2	<Value> <Unit>	1

Table 3-2. Event Texts for RATIOSTN (Continued)

Events	Event Treat pointer	Property text		Event text	
		Standard text	Line No in Event Treat	Standard text	Line No in Event Treat
Upper limit H1 for measured value re-entered	H1L1_TR	MV>H1	2	<Value> <Unit>	2
Lower limit L2 for measured value exceeded	H2L2_TR	MV<L2	1	<Value> <Unit>	1
Lower limit L2 for measured value re-entered	H2L2_TR	MV<L2	1	<Value> <Unit>	2
Upper limit H2 for measured value exceeded	H2L2_TR	MV>H2	2	<Value> <Unit>	1
Upper limit H2 for measured value re-entered	H2L2_TR	MV>H2	2	<Value> <Unit>	2
AI-error On	ERRTR	AISign Err	1	Alarm	1
AI-error Off	ERRTR	AISign Err	1	Normal	2

3.6.4 Group Alarm

It is possible to connect the functional unit RATIOSTN to the group alarm function. This function makes it possible to gather alarms and events from related process signals and objects into Alarm Groups. These groups are then treated as objects.

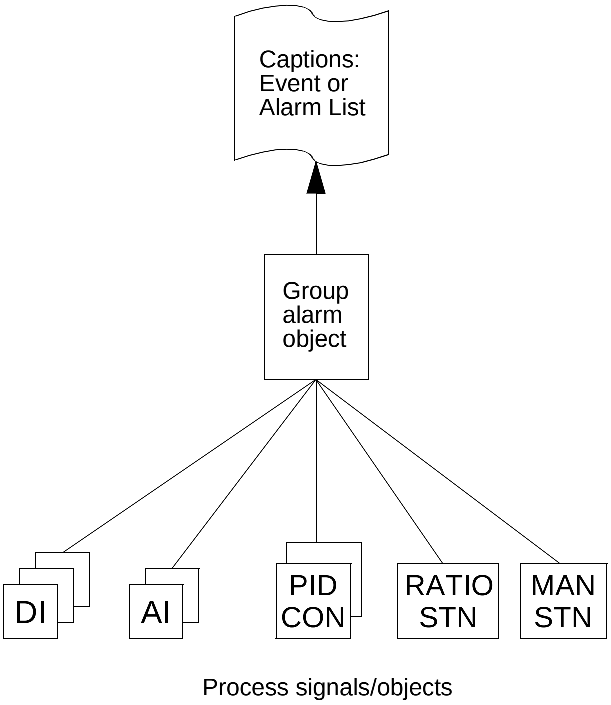


Figure 3-13. Group Alarm

The group alarm function consists of four parts as follows:

- Grouping of process alarms and events with a view to creating pilot alarms and events.
- Blocking of groups
- Automatic acknowledgement
- External alarm outputs.

For a more detailed description of the group alarm function, reference is made to the manual *AdvaCommand Basic Functions User's Guide*.

3.7 Application Example

See the manual *MasterPiece 280 Application Notes.*

Particularly special applications of certain properties of the functional unit are commented on in the following:

- Control of the measured value measurement range.

  If, in certain cases, the parameter MAX or MIN in the data base element is controlled from a PC program to obtain improved resolution in the presentation of staples on the display screen, the following rule must be observed:

  – Staples are only scaled at exchange of display. I.e. to obtain the required function it may be necessary for the operator to exchange the display, for example when a measured value changes and enters the smaller measurement range while the display is on the screen.

- Three different ways for PC programs to block alarms.

  – The alarm can be blocked by applying a control signal to the input ALCBLK of the PC element. In this way, the signal outputs from the PC element, MV_GT_H2, MV_GT_H1, MV_LT_L1, MV_LT_L2, are also blocked. However, no indication of this is obtained on the displays.

  – Alarms can be blocked by applying a control signal to the input ALCBLK of the PC element and to the terminals ABL_H1L1 and ABL_H2L2 of the data base element. In this way, both blocking of the signal outputs and indication on the displays are obtained.

  – If alarms are blocked by connecting a control signal to ABL_H1L1 and ABL_H2L2 only, this is indicated on displays but the signals outputs from the PC element stay unaffected.

3.8 Function diagram

The function diagram in section A.3 in Appendix A describes in detail the relation between all of the signals within the functional unit.

Chapter 4 MANSTN

4.1 General

The functional unit MANSTN is intended for control of unregulated objects e.g. for the manual setting of the position of a continuously adjustable valve.

The manual station MANSTN corresponds functionally to process controller PIDCON when this works in the control modes MAN or E3. That MANSTN has been developed and exists as an independent functional unit depends on the reduction of programming work and computer load obtained if MANSTN can be used instead of PIDCON.

Characteristic properties

The following functions and properties are characteristic of the MANSTN ratio station:

- The control signal can be determined from the operator's work station or obtained from the PC program
- Control modes: MAN, E1
- Automatic tracking
- Integrated tracking functions for bumpless changeover from control mode E1 to MAN
- Alarm or event handling of the more important signals

Examples of Valve Control

Figure 4-1 shows a typical example of valve control.

- The valve can be controlled either centrally from the operator's keyboard or locally from a control unit located at the valve.
- The local control can be connected or disconnected either from the local control unit with a selector or from the operator's keyboard.
- The output signal from MANSTN follows the position of the actuator when the control is local (E1). The return to central control (MAN) is bumpless.
- The measured value is presented on the display screen.

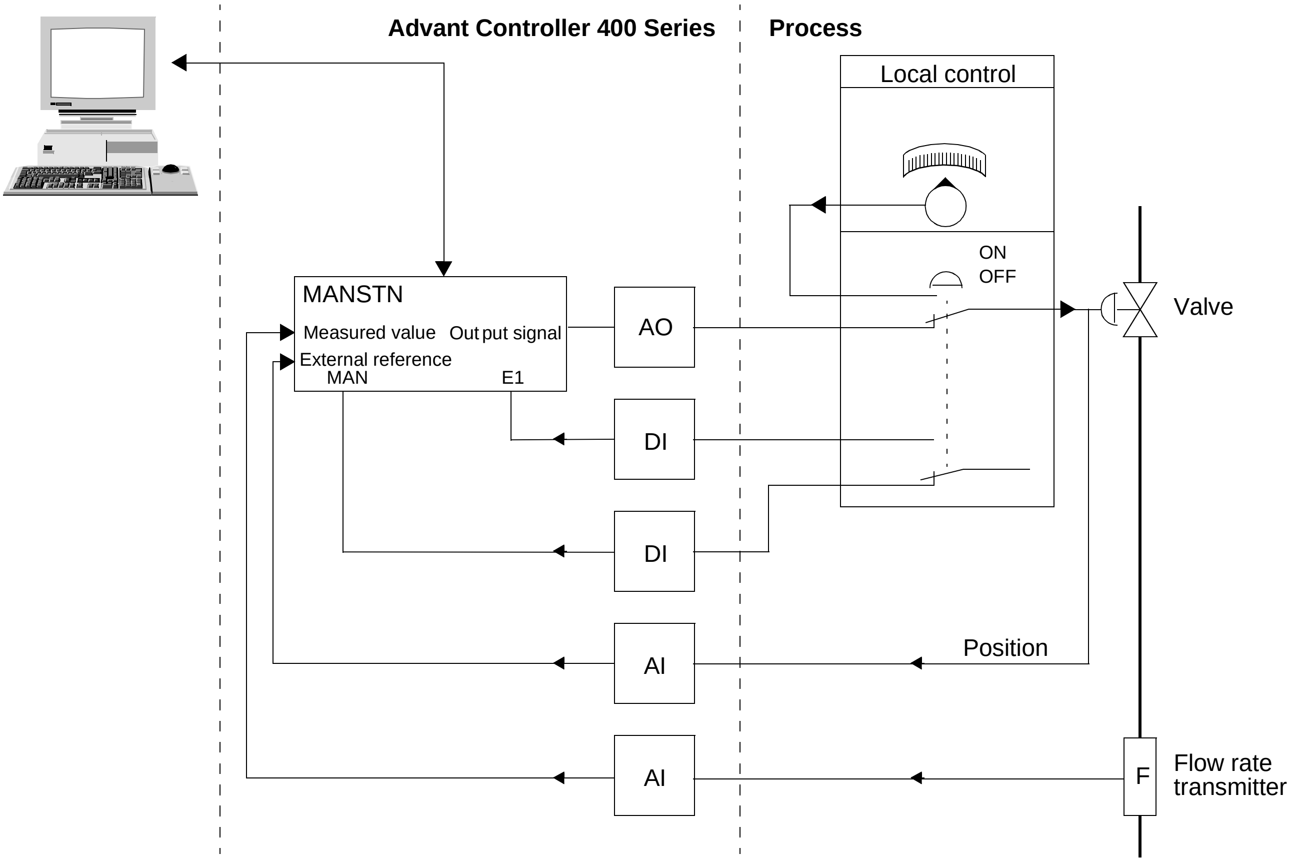


Figure 4-1. Example of valve control with MANSTN

4.2 Configuration

The manual station MANSTN consists of PC element, data base element and operator functions. The configuration is described in manuals for the functional units. Figure 4-2 shows the illustration from part 1.

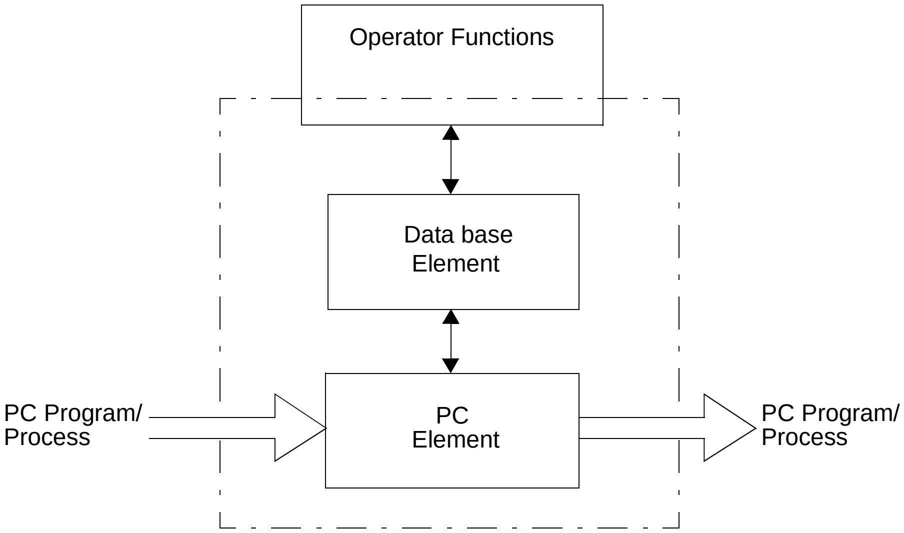


Figure 4-2. Principle of MANSTN configuration

Figure 4-3 and Figure 4-4 show the complete symbols for PC elements and database elements respectively.

4.3 Function

The capabilities of the manual station, MANSTN are the result of the combination of a number of subfunctions.

To understand the properties of the manual station and thereby its capabilities, knowledge of the subfunctions and their connections is required.

This section describes the basic properties of the manual station. The section presents a function block diagram of the manual station.

The subfunctions within each block in the function block diagram are described in detail in Section 4.3.1 Basic Properties - Section 4.3.5 Alarm and Limitation Functions.

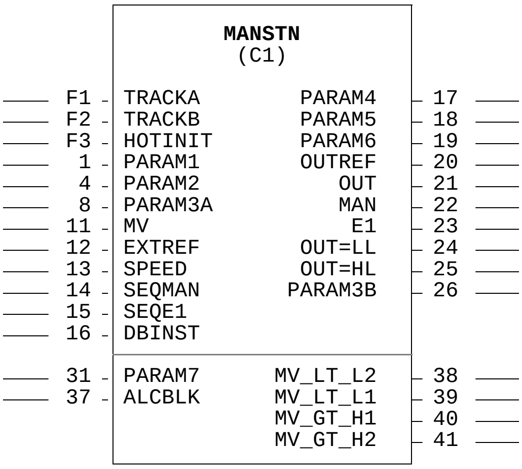


Figure 4-3. PC element, complete symbol

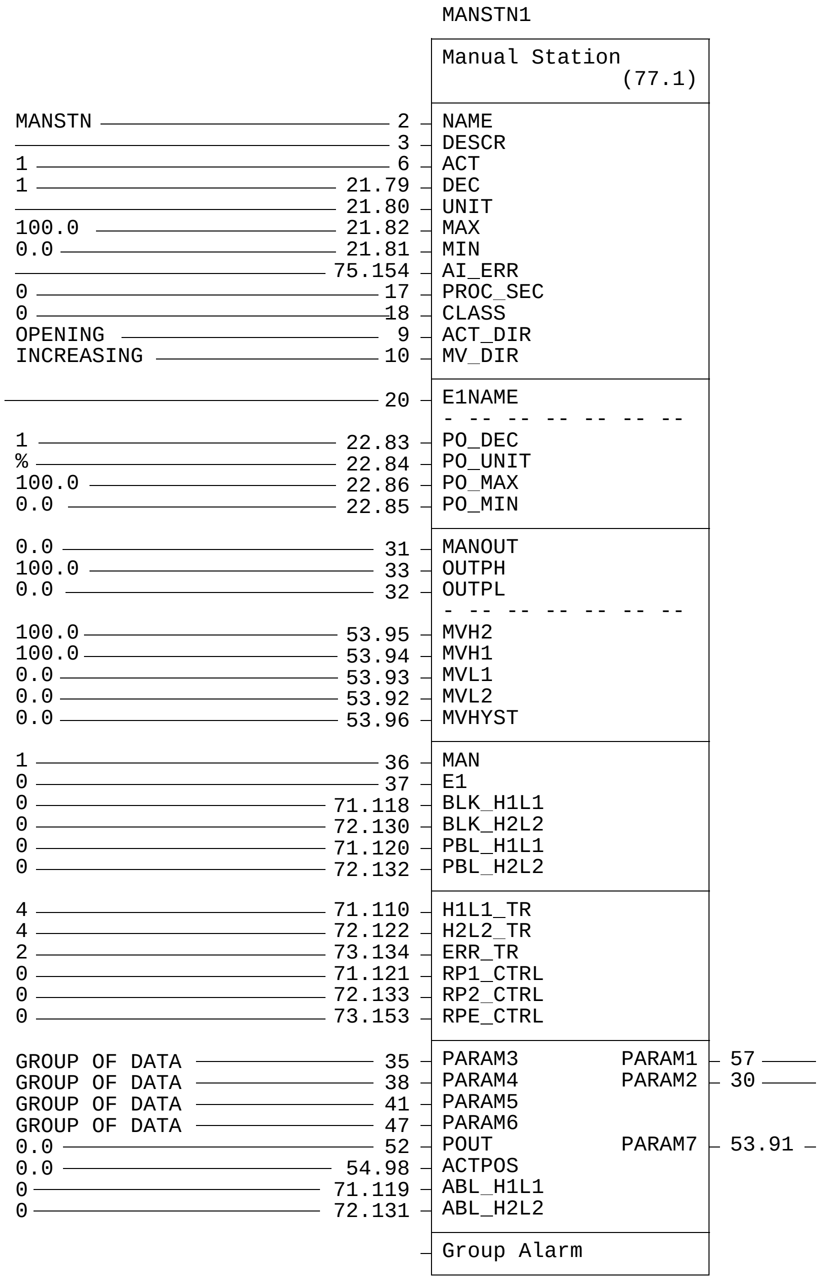


Figure 4-4. Data base element, complete symbol

4.3.1 Basic Properties

Figure 4-5 shows the function block diagram of the manual station. All blocks below MMC/DATA BASE ELEMENT are included in the PC element.

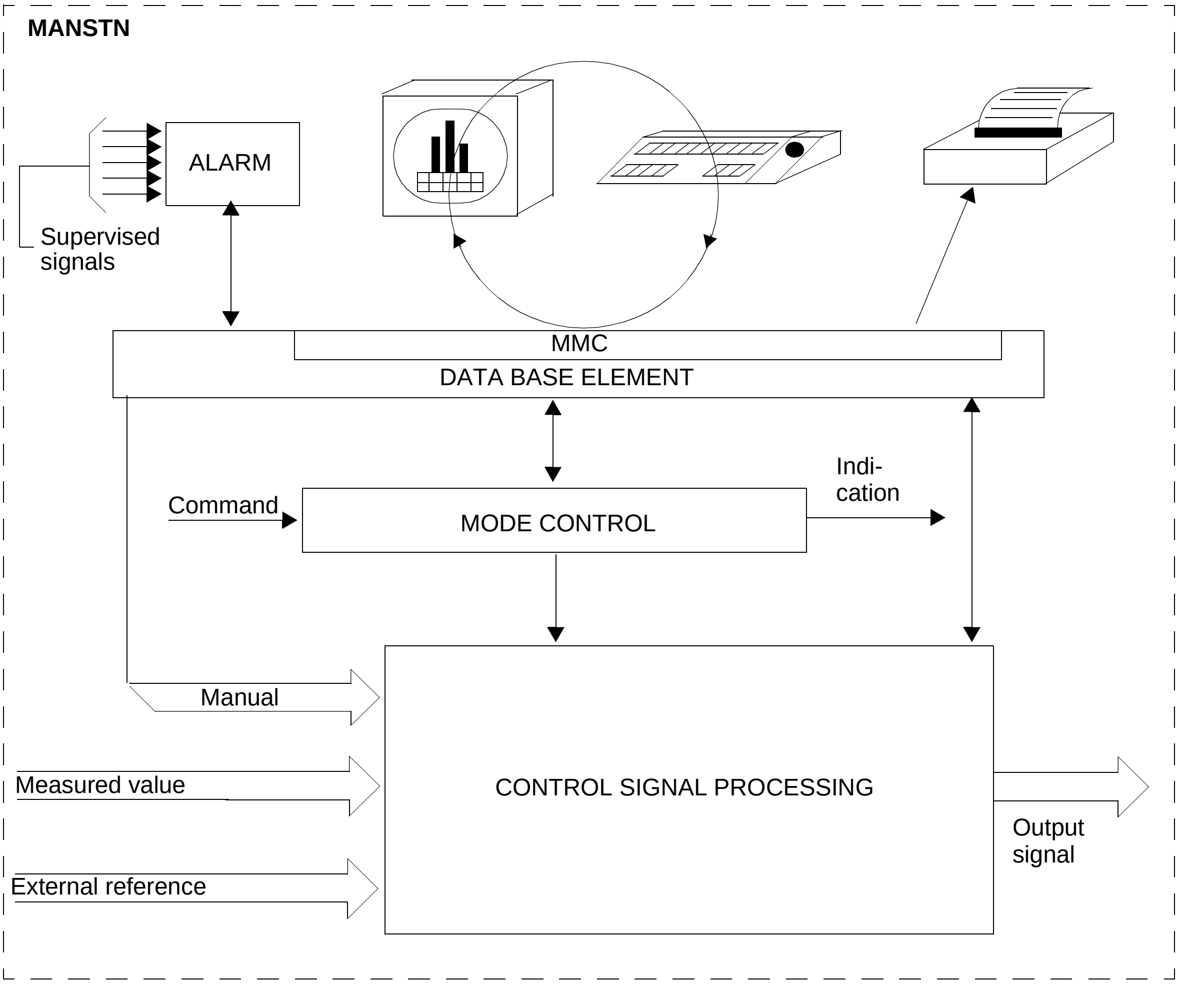


Figure 4-5. Function block diagram MANSTN

The properties of the ratio station are obtained through the functions described in the following:

- A command for the required control mode is given by the operator or from a PC connection. The control signal function is notified of the control mode selection. The display screen and printer, if relevant, are also notified of this via the data base element and MMC. The signal is also available for other purposes such as remote indication of the control mode.
- The control mode selected determines the processing of the signals. The functions are therefore described separately for each of the two different control modes.

Certain common properties should be mentioned before these functions are described. (The figures within parantheses indicate the section which deals with the function concerned):

- The output signal can be subject to limitation of the highest and lowest value. These limitations are determined from the operator's keyboard (Section 4.3.2 Control Mode).
- Tracking functions can be utilized on the manual control signal. Bumpless output signals can be obtained in this way when changing control mode to MAN (Section 4.3.2 Control Mode).
- The manual station works with process-related units. The signal units should be selected, for practical reasons, from one of the following two alternatives:
  - Alt.1 Measured value and output signal in the same process-related unit.
  - Alt.2 Measured value in process-related units, the output signal as a percentage.

Function Description MAN

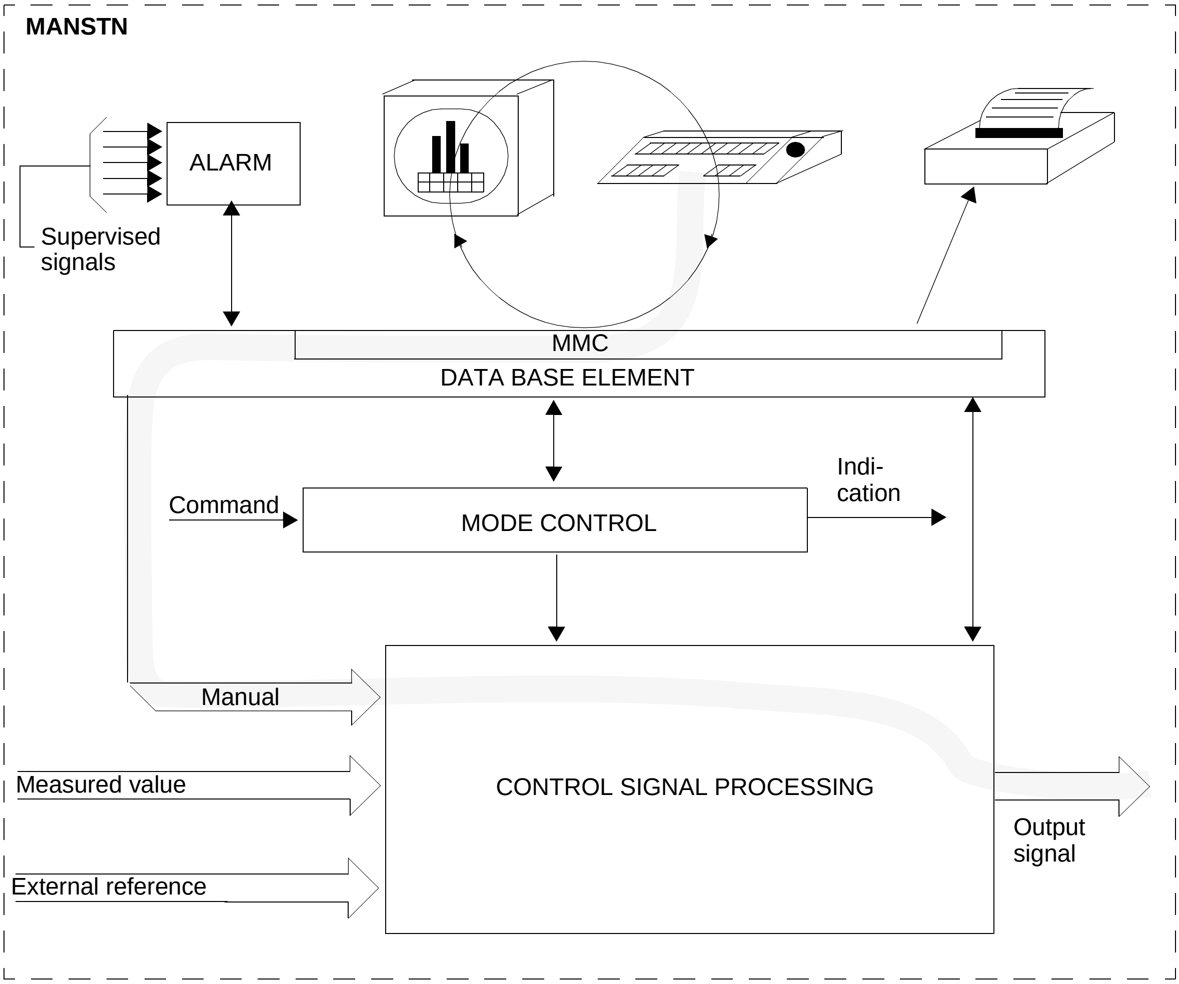


Figure 4-6. Signal flow with control mode MAN

When control mode MAN (MANual) is selected, the signal is controlled by the operator, via the keyboard. The control mode can be commanded from the operator's keyboard, from another PC element or from an external control device.

The control mode MAN can also be commanded automatically on receiving an incorrect signal from an analog input (AI). This automatic command is described below under the heading CONTROL MODE.

NOTE

> The control mode MAN is used when direct output signal control from the operator's keyboard is required.

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
Manual	MANOUT	DB-S3:31
Output signal	OUT	PC-C0:21

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 4-3.

Function Description E1

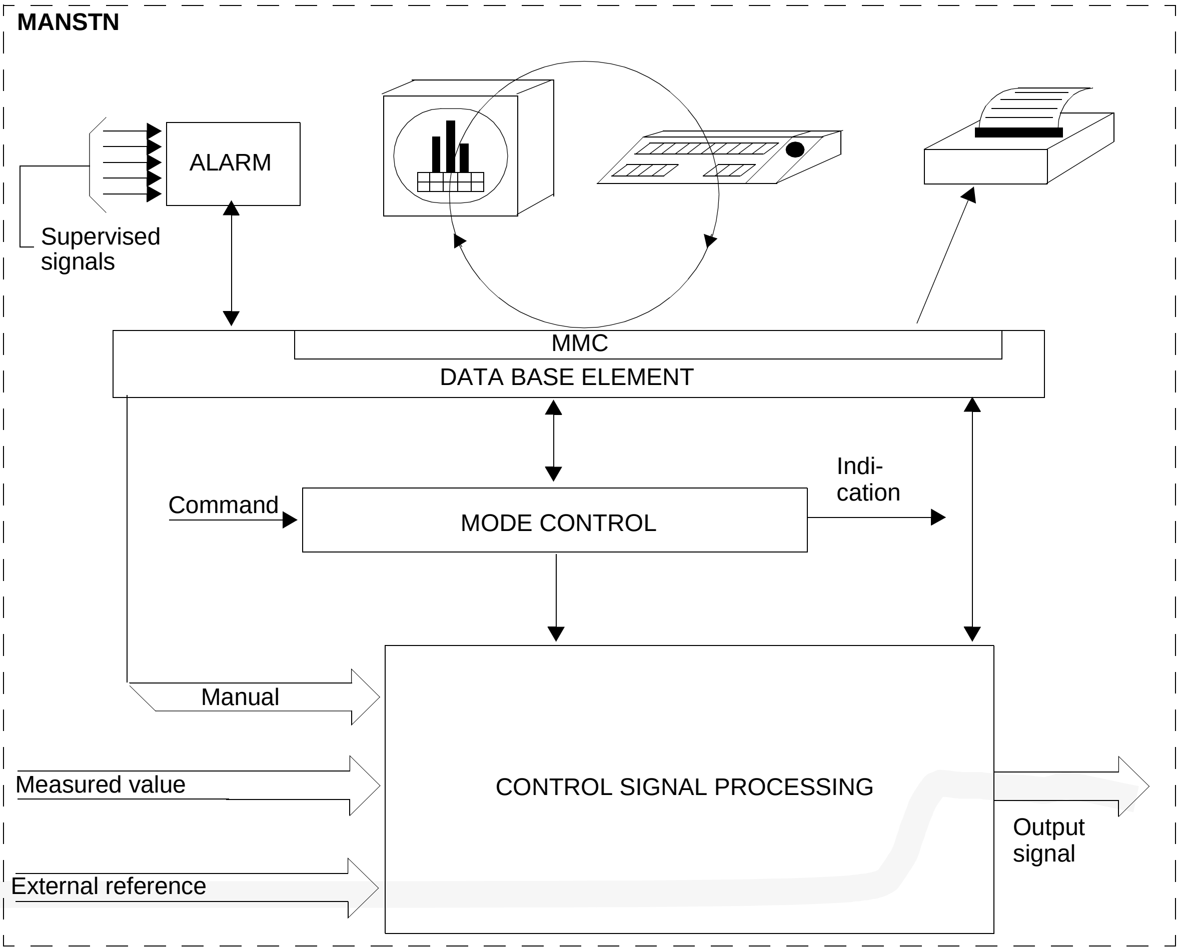


Figure 4-7. Signal flow with control mode E1

When the equipment is in the control mode E1, external 1, the output signal is forced to follow an external reference signal.

Control mode E1 can be commanded from the operator’s keyboard, from another PC element or from an external control device

NOTE

Control mode E1 is used when forced control from a place other than the operator’s keyboard is required.

Examples of use:

- When the output signal is to follow exactly the output of a transducer located in the process.
- Manual control from a device installed in the process.
- Emergency stop

The designations of the signals used in the description are as follows:

Designation	**Abbreviation**	**Location** [1]
External reference	EXTREF	PC-C0:12
Output signal	OUT	PC-C0:21

1. Location:

   Element type–Element section:Terminal number

   (where C0 =element header), see Figure 4-3.

4.3.2 Control Mode

Figure 4-8 shows the function block, MODE CONTROL. The figure includes a function table with the signals which constitute the control mode change command and signal outputs.

Control Mode Change

The inputs are of two different types; static (STAT) and dynamic (DYN).

STAT	An input of static type must be activated the whole time the corresponding control mode is applied. If the signal at the input disappears, the control mode changes over to MAN.
DYN	The dynamic input is only initiating. The control mode is selected when a change from 0 to 1 occurs at the input.

MAN

The control mode MAN is commanded by

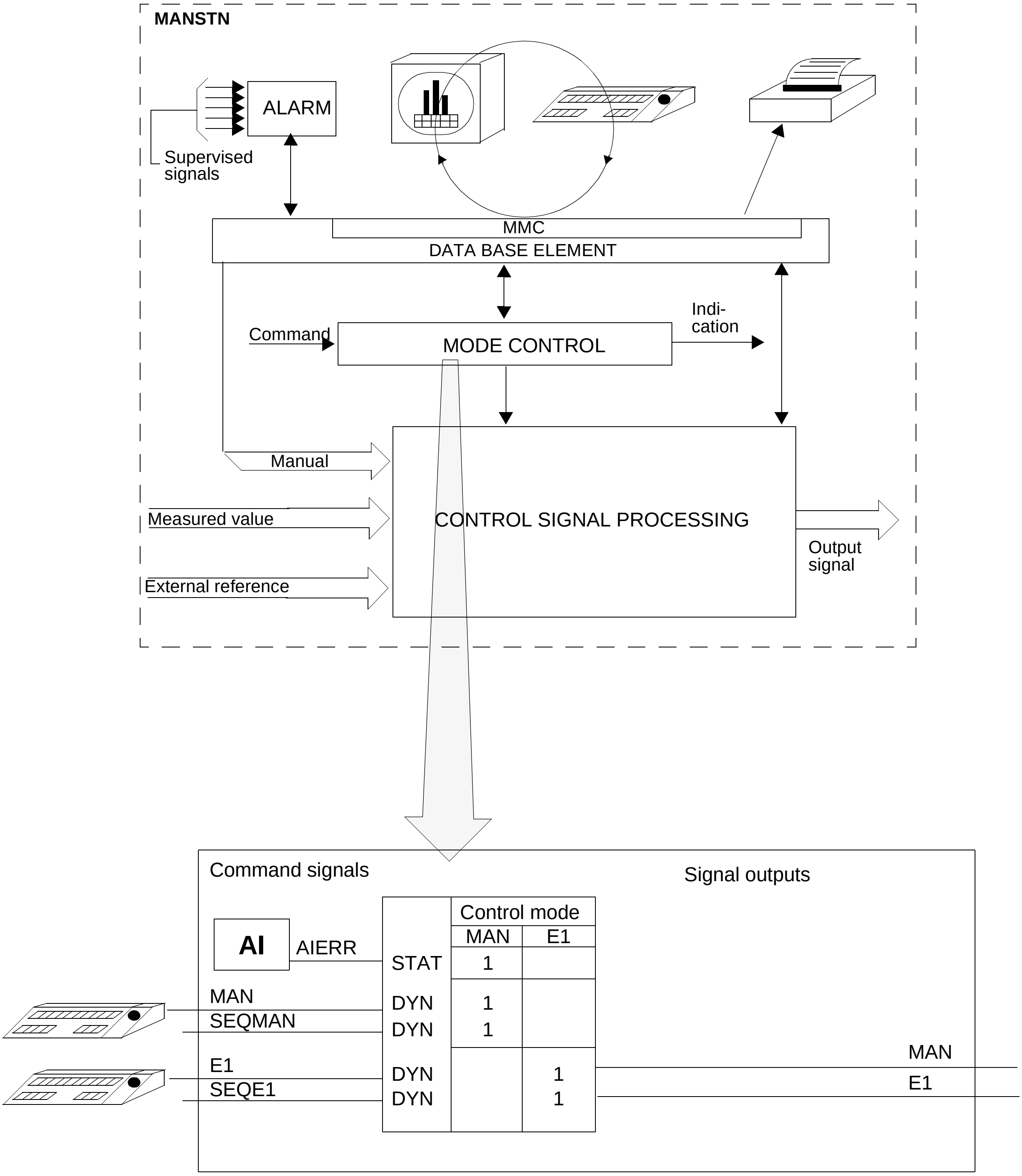
AIERR	ERROR initiation of control mode MAN (see below).
MAN	Change from the operator's keyboard.
SEQMAN	PC-C0:14

ERROR initiation of control mode MAN

A status signal, AIERR, is initiated from the analog input AI when certain faults develop.

These include

- Loss of current signal
- Overflow
- Board fault (diagnostic)
- A/D converter fault



	Control mode	
	MAN	E1
STAT	1	
DYN	1	
DYN	1	
DYN		1
DYN		1

Figure 4-8. Function block MODE CONTROL

Information regarding the quality of the measured value is obtained from the AI and is copied to the manual station for automatic processing of any error and for presentation. The AI concerned is pointed out at the population of the data base element for MANSTN.

When AIERR is activated, the control mode of the controller changes over to MAN and the output signal is frozen at its value when the error signal was generated. It is then possible to control the output signal manually.

When the fault (AIERR) disappears, all of the indications are reset to zero. The manual station remains however in the control mode MAN until another control mode is requested automatically or by the operator.

E1

Control mode E1 is commanded by

Abbreviation	**Location** [1]	**Description**
E1		Change-over from operator's keyboard.
SEQE1	PC-C0:15	

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 4-3.

Signal outputs

Abbreviation	**Location** [1]	**Description**
MAN	PC-C0:22	Activated when the control mode is MAN.
E1	PC-C0:23	Activated when the control mode is E1.

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 4-3.

The signals MAN and E1 can be used for control of other PC elements or for external functions, indications etc.

4.3.3 Control Signal Processing

CONTROL SIGNAL PROCESSING contains the following functions:

- Selection of output signal reference
- Tracking
- Ramp function
- Limitations

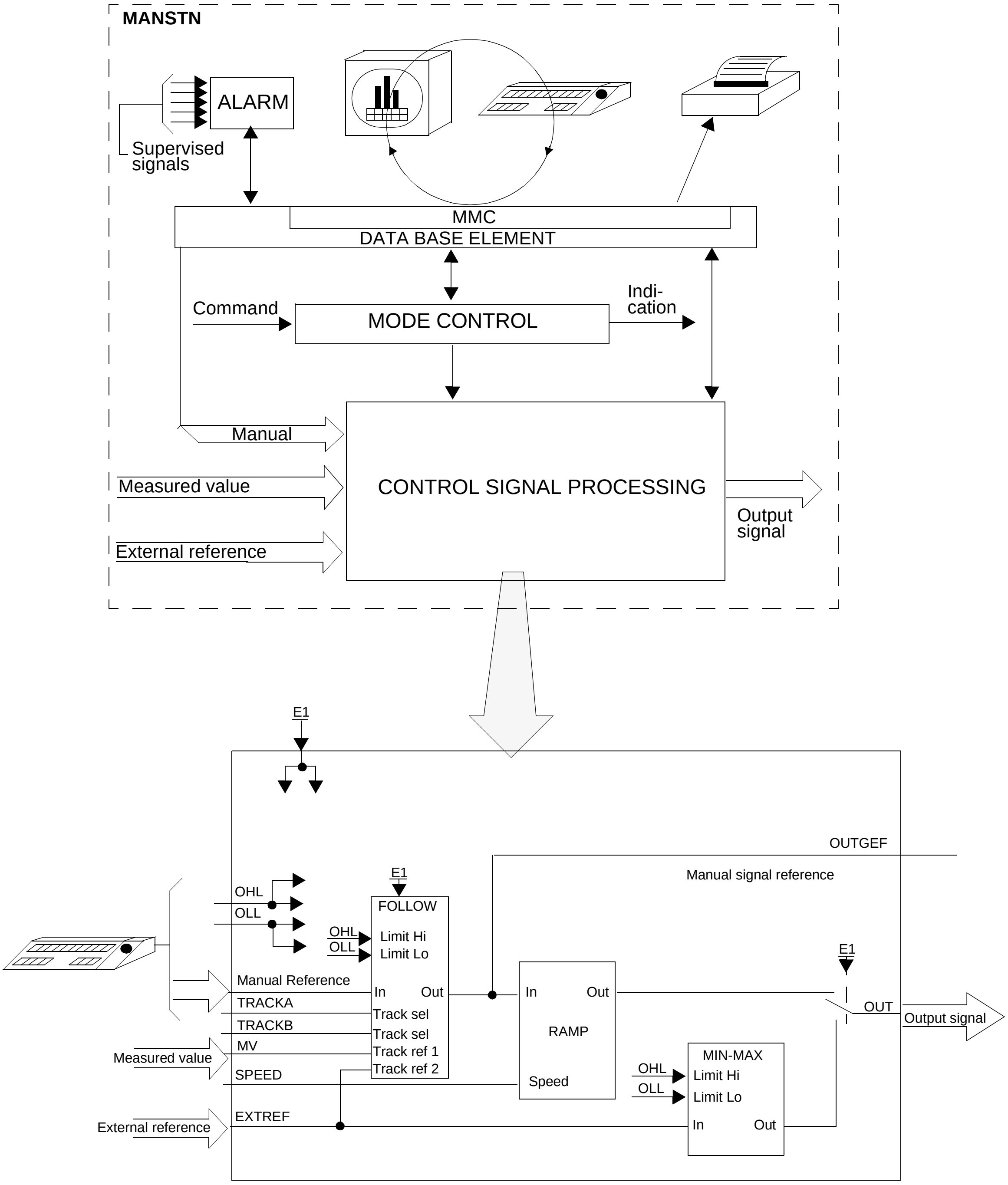


Figure 4-9. Function block CONTROL SIGNAL PROCESSING

Selection of Output Signal References

The output signal can be selected from one of the following two references:

- Manual reference, selected when the control mode is MAN
- External reference, selected when the control mode is E1

Tracking

Two tracking functions are built in for the manual output signal reference (OUTREF). The tracking function can be activated in control mode E1 and gives either bumpless connection of OUTREF or connection of OUTREF with constant signal value.

With bumpless switch-over, E1 to MAN, the output signal (OUT) will go to the operator-entered reference (OUTREF) in accordance with the ramp parameter SPEED.

With switch-over with constant signal value, the output signal (OUT) is not changed because the manual output signal reference (OUTREF) has been updated from the external output signal reference (EXTREF).

The tracking function is selected with the function parameters TRACKA, TRACKB. See Section 4.4 PC Element MANSTN.

Signal Descriptions

Abbreviation	**Location** [1]	**Description**
TRACKB	PC-C0:F2	Function parameter for tracking.
TRACKA	PC-C0:F1	Function parameter for tracking.
MV	PC-C0:11	Measured value
SPEED	PC-C0:13	Highest permitted rate of change.
EXTREF	PC-C0:12	External reference.
OUTREF	PC-C0:20	Manual signal reference.
OUT	PC-C0:21	Output signal.

1. Location:
   Element type–Element section:Terminal number
   (where C0 =element header), see Figure 4-3.

4.3.4 Ramp Function

A ramp function is provided to determine the highest permitted rate of change of the output signal with changes of the manual signal level and on return to the control mode MAN.
The operational parameter for the ramp function is SPEED.

Limitations

An upper and a lower limit can be applied to the output signal from the operator's keyboard (OHL and OLL respectively). The limiting values can be set equal but cannot be crossed. The application of a limitation is indicated.

4.3.5 Alarm and Limitation Functions

The function block ALARM monitors the following signals:

Measured value	MV	with two upper and two lower alarm limits.
Output signal	OUT	with one upper and one lower limitation.

When an alarm limit is exceeded, an alarm is presented on the display screen (and printer, if provided). The alarms are also available as outputs on the PC element.

Alarm Limits

When determining the alarm limits, the following rule applies:

$$H2 \geq H1 \geq L1 \geq L2$$

If an attempt is made to cross the alarm limits with each other, the operator is notified that the operation is not permitted. There is no change of the limit.

Alarm Blocking

All supervision of the measured value (MV) can be blocked by activating the connection ALCBLK. The signal outputs are also affected by this blocking (as distinct from operator's blockings which only block display screen and printer).

The event handling function makes it possible to block alarms for type errors 1 and 2 from the operator's station, or from PC via the data base element.

Type 1 errors include:	$MV \geq H1$
	$MV \leq L1$
Type 2 errors include:	$MV \geq H2$
	$MV \leq L2$

This form of alarm blocking means that the printer and display screen and updating of the error list are blocked. The PC outputs are not affected.

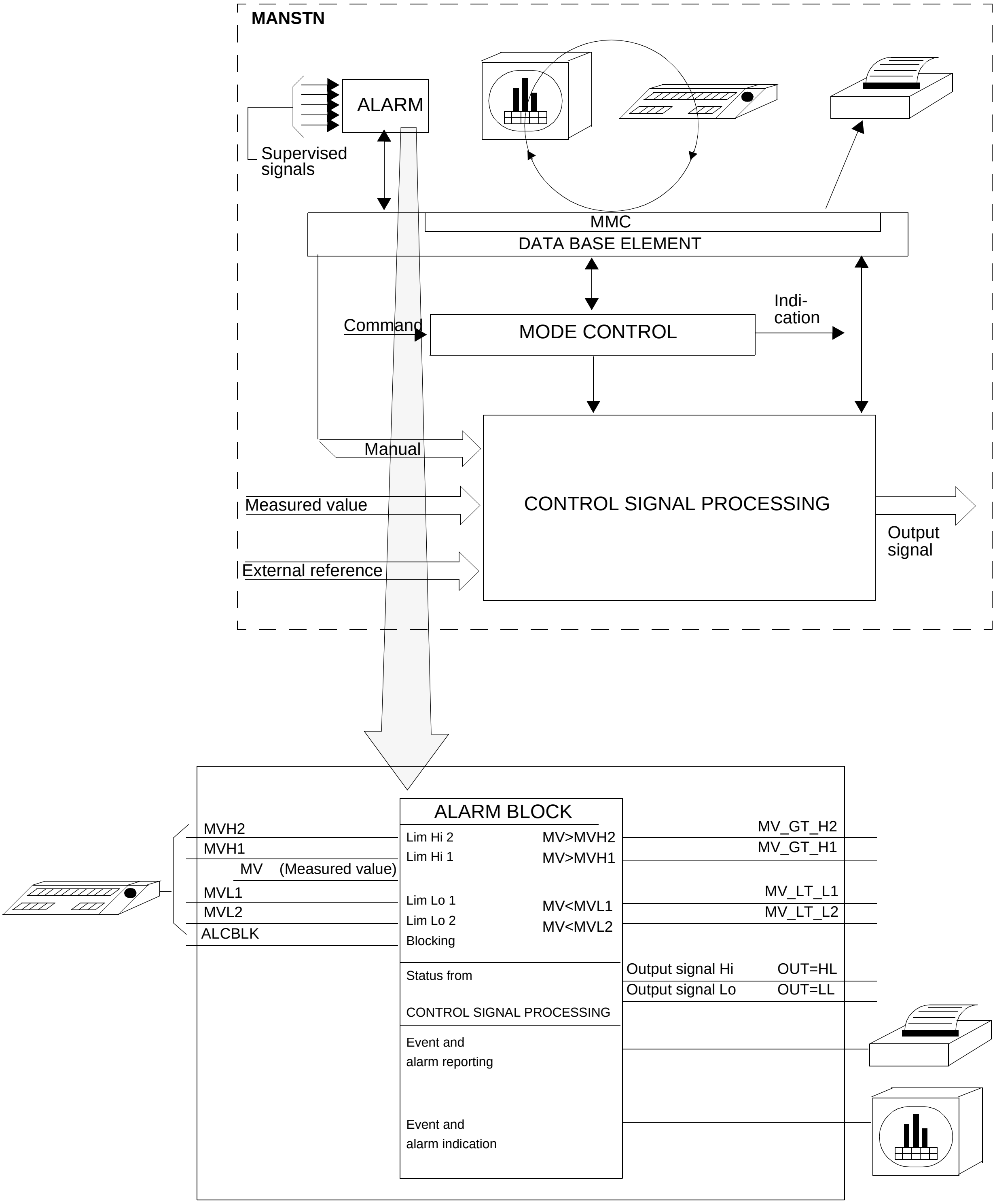


Figure 4-10. Function block ALARM

Signal Descriptions

Abbreviation	Location [1]	Description
ALCBLK	PC-C1:37	Blocking of alarm on MV
MV_GT_H2	PC-C1:42	Measured value exceeds H2
MV_GT_H1	PC-C1:41	Measured value exceeds H1
MV_LT_L1	PC-C1:40	Measured value less than L1
MV_LT_L2	PC-C1:39	Measured value less than L2
OUT=HL	PC-C0:25	Output signal limitation high
OUT=LL	PC-C0:24	Output signal limitation low

[1] Location:
Element type–Element section:Terminal number
(where C0 =element header), see Figure 4-3.

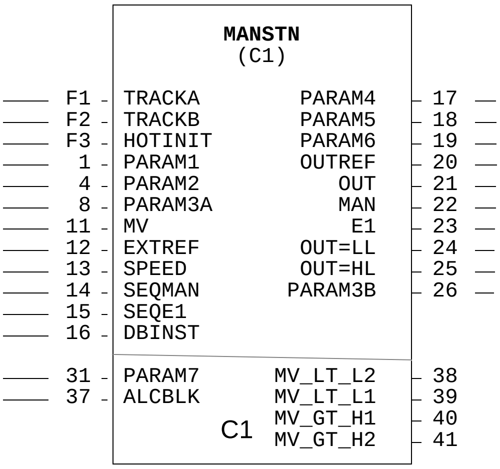
4.4 PC Element MANSTN

The information about the PC element in the functional unit MANSTN, its extension with call parameters and its connection description are given mainly in data sheet form. This data sheet is included in the manual *PC Elements Advant Controller 400 Series Reference Manual* in which all of the PC elements included in the Advant Controller 410/450 products are assembled.

Manual Station MANSTN

Summary

The PC element MANSTN forms part of the function unit MANSTN (**MAN**ual **ST**atio**N**). The unit is primarily used for manual control of continuously presettable control objects or for manual references to other control equipment. It is used in traditional instrumentation when a VDU based operator station is required.



PC element MANSTN

Call MANSTN (C1)

The element consists of one basic part that may be extended with an additional function.

Parameter	Significance	Permissible values
C1	Selection of measured value alarm	0 .. 1

Terminal Description

No	Name	Type	Description
F1	TRACKA	II	**TRACK**ing **A**. Function parameter for tracking A.
F2	TRACKB	II	**TRACK**ing **B**. Function parameter for tracking B.
F3	HOTINIT	II	**HOT INIT**. Function parameter for warm start.
1	PARAM1	II	**PARAM**eter **1**. Connection to the data base element (PARAM1).
4	PARAM2	IA16	**PARAM**eter **2**. Connection to the data base element (PARAM2).
8	PARAM3A	II	**PARAM**eter **3A**. Connection to the data base element (PARAM3).
11	MV	IR	**M**easured **V**alue. Input for measured value.
12	EXTREF	IR	**EXT**ernal **REF**erence. Input for external reference.
13	SPEED	IR	Input for maximum change rate for MAN output signal (engineering unit/second).
14	SEQMAN	IB	**SEQ**uential **MAN**ual. Pulse input for ordering manual operation mode.

Terminal Description

No	Name	Type	Description
15	SEQE1	IB	**SEQ**uential **E1**. Pulse input for ordering operation mode E1.
16	DBINST	II	**D**ata **B**ase **INST**ance. An operational parameter or a constant, defining the instance number of the data base element (to be defined in its header). Alternatively, a connection to the data base element.
17	PARAM4	OI	**PARAM**eter **4**. Connection to the data base element (PARAM4).
18	PARAM5	OI	**PARAM**eter **5**. Connection to the data base element (PARAM5).
19	PARAM6	OA16	**PARAM**eter **6**. Connection to the data base element (PARAM6).
20	OUTREF	OR	**OUT**put **REF**erence. Reference for manual output signal.
21	OUT	OR	**OUT**put. Output signal.
22	MAN	OB	**MAN**ual. Output for indication of operation mode. This output is set to 1 in operation mode MAN.
23	E1	OB	**E1**. Output for indication of operation mode. This output is set to 1 in operation mode E1.
24	OUT=LL	OB	**OUT**put**=L**ow **L**imit. Output for indication of output signal limiting. This output is set to 1 when the output signal has been limited to a lower limit value.
25	OUT=HL	OB	**OUT**put**=H**igh **L**imit. Output for indication of output signal limiting. This output is set to 1 when the output signal has been limited to a higher limit value.
26	PARAM3B	OI	**PARAM**eter **3B**. Connection to the data base element (PARAM3).
31(1)	PARAM7	IA24	**PARAM**eter **7**. Connection to the data base element (PARAM7).
37(1)	ALCBLK	IB	**AL**arm **C**ontrol **BL**oc**K**. Input which, when set to 1, blocks the limit value alarm for the measured value (MV).
38(1)	MV_LT_L2	OB	**M**easured **V**alue**_LT_L**ow **2**. Indication of measured value limit. This output is set to 1 when the measured value (MV) falls below alarm limit L2.
39(1)	MV_LT_L1	OB	**M**easured **V**alue**_LT_L**ow **1**. Indication of measured value limit. This output is set to 1 when the measured value (MV) falls below alarm limit L1.
40(1)	MV_GT_H1	OB	**M**easured **V**alue**_GT_H**igh **1**. Indication of measured value limit. This output is set to 1 when the measured value (MV) exceeds alarm limit H1.
41(1)	MV_GT_H2	OB	**M**easured **V**alue**_GT_H**igh **2**. Indication of measured value limit. This output is set to 1 when the measured value (MV) exceeds alarm limit H2.

(1) These connections are available only if the call parameter C1 is set to 1**.**

Selection of parameters for the tracking function of MANOUT

Track A	Track B	Description
0	0	No tracking
1	0	MANOUT is not affected. Changeover to MAN takes place by OUT taking on the measured value, MV. Thereafter OUT is ramped to equal MANOUT with a speed that is determined by SPEED. ”Tracking” takes place in the operating mode E1.

Selection of parameters for the tracking function of MANOUT

Track A	Track B	Description
2	0	MANOUT is not affected. Changeover to MAN takes place bumplessly by OUT retaining the value of EXTREF. Thereafter OUT is ramped to equal MANOUT with a speed that is determined by SPEED. ”Tracking” takes place in the operating mode E1.
1	1	MANOUT tracks the measured value, MV. Changeover to MAN takes place by MANOUT taking on the measured value, MV. Tracking takes place in the operating mode E1.
2	1	MANOUT tracks the external reference EXTREF. Changeover to MAN takes place both without bumps and changes by MANOUT taking on the value of the external reference EXTREF. Tracking takes place in the operating mode E1.

HOTINIT

HOTINIT	Function with warm start Operation mode	Output signal
0	unchanged	unchanged
1	MAN	unchanged
2	MAN	0 or OLL
“unchanged” means: no change in relation to the state in effect before the event that caused the warm start.		

4.4.1 Connections to Data Base Elements

The following connections are made in the PC program to transfer information between PC element and data base element.

Table 4-1. Connections to data base elements

No	Name	Terminals in the data base element
1	PARAM1	PARAM1
4	PARAM2	PARAM2
8	PARAM3A	PARAM3
16	DBINST	Either DB=NAME or D=INSTANCE NUMBER of data base element
17	PARAM4	PARAM4
18	PARAM5	PARAM5
19	PARAM6	PARAM6
21	OUT	POUT
26	PARAM3B	PARAM3

If C1 = 1, in addition,

31	PARAM7	PARAM7

In addition, the measured value input MV and the output signal OUT are connected to I/O in the normal manner.

4.5 Data Base Element MANSTN

Information about the data base element in the functional unit MANSTN is given in data sheet form. This data sheet is included in the manual *Data Base Elements Advant Controller 400 Series Reference Manual* in which all of the data base elements included in the Advant Controller 410/450 products are assembled.

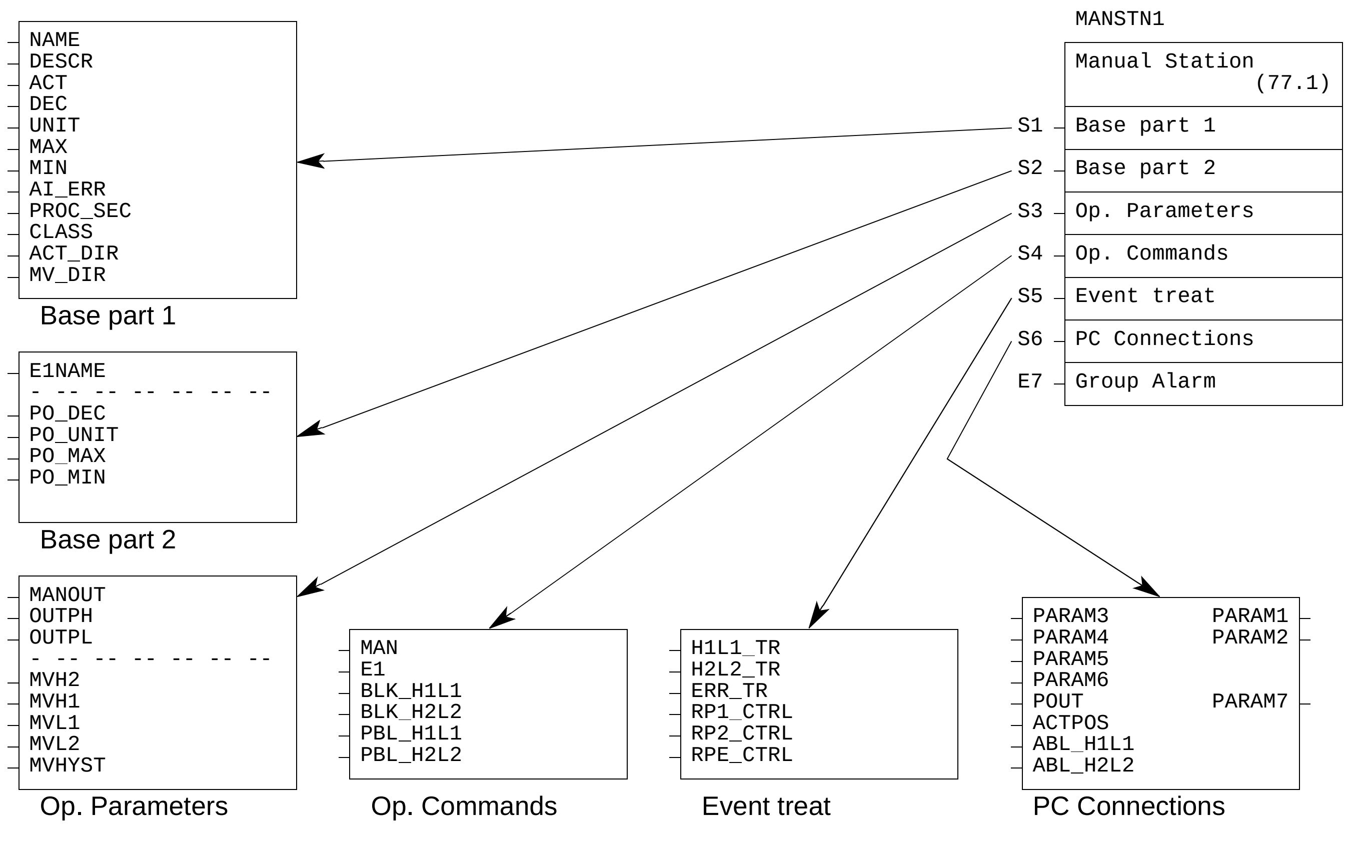
Manual Station MANSTN

Summary

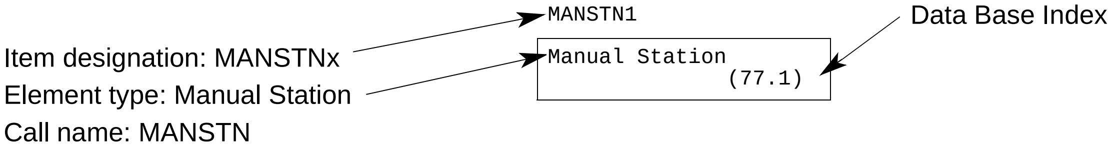
The Manual Station data base element is used to build up Advant Station 500 Series Operator Station functions for the MANSTN functional unit. Some static information in the displays can be given. Parameters which can be changed from the dialog can be given start values. The element performs an interface between the PC-program/process function and Advant Station 500 Series Operator Station.

For information about the extension parts of Group Alarm see data base element Group Member.

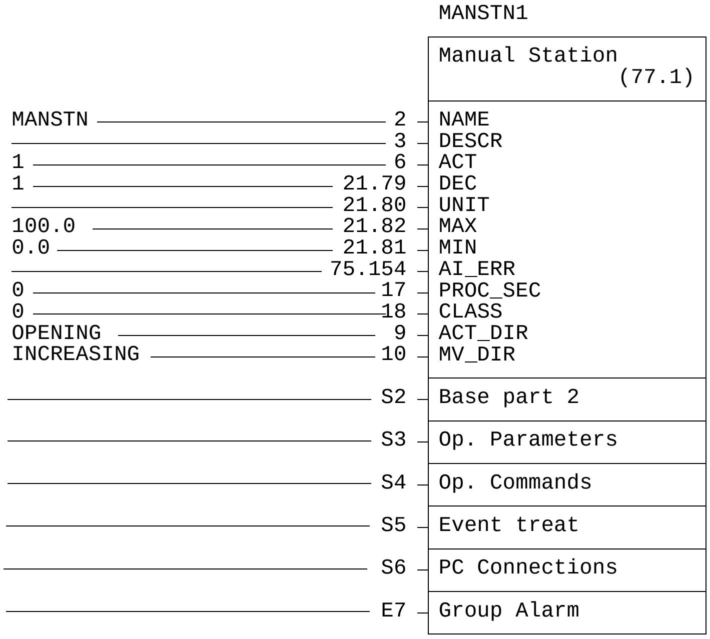
Overview



Head



Base part 1



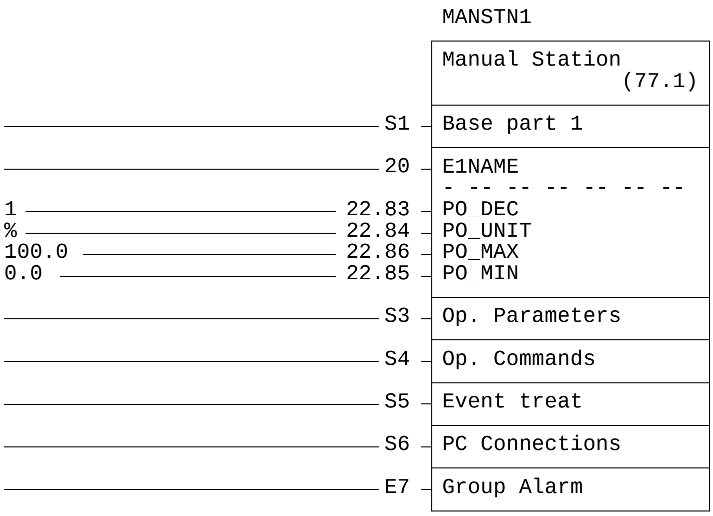
Terminal Description, Base part 1

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	NAME	user	MAN STNx	–	Each Manual Station must have a unique **NAME**. E.g. HICA112.	Max. 20 characters. Spaces are not allowed.
3	DESCR	user	–	–	This **DESCR**iption of the Manual Station will be shown in Operator Station.	Max. 20 characters. You may enter any information regarding the controller.
6	ACT	user	1	B(r/w)	1=The generator communication is **ACT**ive.	0=dialog is blocked and events are not updated.

Terminal Description, Base part 1 (Continued)

Terminal No	**Terminal Name**	**Value entered by**	**Default value**	**PC connection data type**	**Description**	**Remarks**
21.79	DEC	user	1	–	The number of **DEC**imals for measured value and its alarm limits.	A total number of 5 figures plus point and sign can be presented. 0..6 decimals.
21.80	UNIT	user	–	A6(r)	The **UNIT** of the measured value in engineering unit.	Max. 6 characters shown in Operator Station and data base element.
21.82	MAX	user	100.0	R(r/w)	**MAX**imum value within measuring range.	Used for scaling of bar graph.
21.81	MIN	user	0.0	R(r/w)	**MIN**imum value within measuring range.	Used for scaling of bar graph.
75.154	AI_ERR	user	–	–	Reference to the Analog Input element which is used for the measured value.	Connects error flag in the analog input to MANSTN. E.g. FT107. Change is carried out at next system init.
17	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
18	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
9	ACT_DIR	user	OPE NING	B(r/w)	Used for presentation in the object and group displays. OPENING: actuator open at 100% output. CLOSING: actuator closed at 100% output.	–
10	MV_DIR	user	INCREA SING	B(r/w)	Used for presentation in the object and group display. INCREASING: measured value increases at increasing output. DECREASING: measured value decreases at increasing output.	–

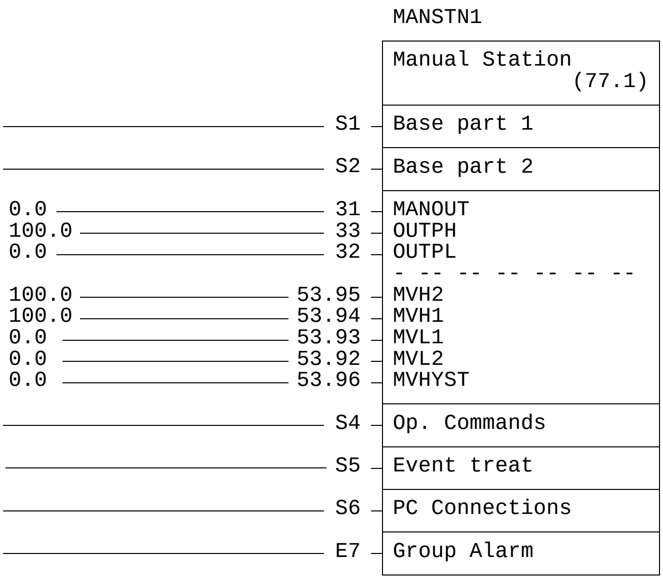
Base part 2



Terminal Description, Base part 2

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
20	E1NAME	user	–	–	**NAME** of **E**xternal reference.	The text entered here will be presented in the object display under ”CONTROL MODE”. Max 20 characters.
22.83	PO_DEC	user	1	–	The number of **DEC**imals for **P**rocess **O**utput value presentation.	A total number of 5 figures plus point and sign can be presented. DEC can be 0..6.
22.84	PO_UNIT	user	%	A6(r)	The **UNIT** for the **P**rocess **O**utput value in engineering unit.	Max. 6 characters shown in Operator Station and data base element.
22.86	PO_MAX	user	100.0	R(r/w)	**MAX**imum **P**rocess **O**utput value.	Used for scaling of bar graph.
22.85	PO_MIN	user	0.0	R(r/w)	**MIN**imum **P**rocess **O**utput value.	Used for scaling of bar graph.

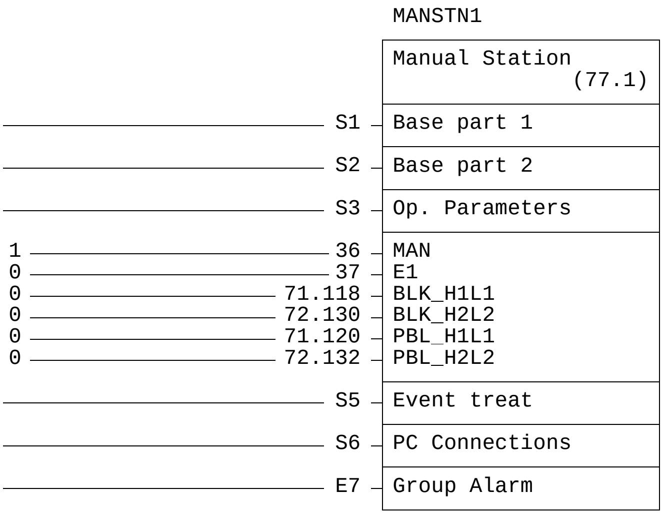
Operators Parameters



Terminal Description, Operators Parameters

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
31	MANOUT	dialog	0.0	R(r/w)	**MAN**ual **OUT**put.	Unit acc. to PO_UNIT.
33	OUTPH	dialog	100.0	R(r/w)	**OUTP**ut **H**igh limit.	Unit acc. to PO_UNIT.
32	OUTPL	dialog	0.0	R(r/w)	**OUTP**ut **L**ow limit.	Unit acc. to PO_UNIT.
53.95	MVH2	dialog	100.0	R(r/w)	Alarm limit **H2** of **M**easured **V**alue.	Unit acc. to PO_UNIT.
53.94	MVH1	dialog	100.0	R(r/w)	Alarm limit **H1** of **M**easured **V**alue.	Unit acc. to PO_UNIT.
53.93	MVL1	dialog	0.0	R(r/w)	Alarm limit **L1** of **M**easured **V**alue.	Unit acc. to PO_UNIT.
53.92	MVL2	dialog	0.0	R(r/w)	Alarm limit **L2** of **M**easured **V**alue.	Unit acc. to PO_UNIT.
53.96	MVHYST	dialog	0.0	R(r)	**HYST**erises for alarm limits of **M**easured **V**alue.	Unit acc. to PO_UNIT.

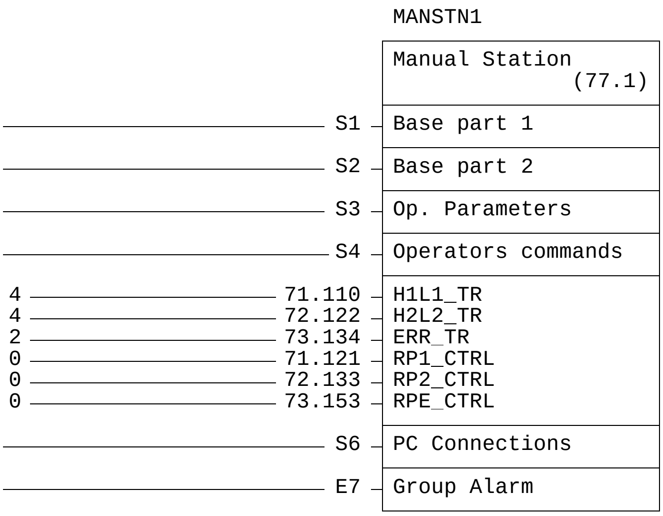
Operators Commands



Terminal Description, Operators Commands

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
36	MAN	dialog	1	B(r/w)	**MAN**ual mode.	Converted to pulse by the system.
37	E1	dialog	0	B(r/w)	**E**xternal mode **1**.	Converted to pulse by the system.
71.118	BLK_H1L1	dialog	0	–	**BL**oc**K** alarms **H1**, **L1**.	–
71.130	BLK_H2L2	dialog	0	–	**BL**oc**K** alarms **H2**, **L2**.	–
71.120	PBL_H1L1	dialog	0	–	**BL**ock **P**rinter for **H1** and **L1** alarms. Blocking of printer for H1 and L1 alarms.	–
72.132	PBL_H2L2	dialog	0	–	**BL**ock **P**rinter for **H2** and **L2** alarms. Blocking of printer for H2 and L2 alarms.	–

Event treat



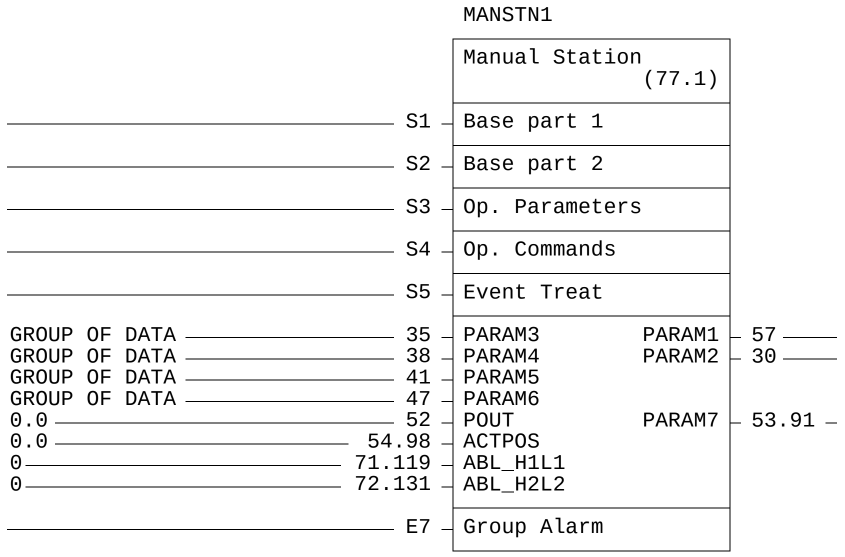
Terminal Description, Event treat

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
71.110	H1L1_TR	user	4	–	Alarm **H1** and **L1** **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of the alarms H1 and L1.	–
72.122	H2L2_TR	user	4	–	Alarm **H2** and **L2** **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of the alarms H2 and L2.	–
73.134	ERR_TR	user	2	–	**ERR**or **TR**eatment. Instance number of the data base element Event Treat located in Operator Station and defining event treatment of signal error in the analog input connected to the manual station.	–
71.121	RP1_CTRL	user	0	–	**R**e**P**eat fail **C**on**TR**o**L** for alarms H**1** and L**1**. Blocking of repeating H1 and L1 alarms.	–
72.133	RP2_CTRL	user	0	–	**R**e**P**eat fail **C**on**TR**o**L** for alarms H**2** and L**2**. Blocking of repeating H2 and L2 alarms.	–

Terminal Description, Event treat (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
73.153	RPE_CTRL	user	0	–	**R**e**P**eat fail **C**on**TR**o**L** for signal **E**rror. Blocking of repeating signal error in the analog input connected to the manual station.	–

PC Connections



Terminal Description, PC Connections

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
35	PARAM3	PC	–	I(r/w)	Group of data to be connected to the PC element connections **PARAM3**A and **PARAM3**B.	–
38	PARAM4	PC	–	I(r/w)	Group of data to be connected to the PC element connection **PARAM4**.	–
41	PARAM5	PC	–	I(r/w)	Group of data to be connected to the PC element connection **PARAM5**.	–
47	PARAM6	PC	–	A16(r/w)	Group of data to be connected to the PC element connection **PARAM6**.	–

Terminal Description, PC Connections (Continued)

Terminal No	**Terminal Name**	**Value entered by**	**Default value**	**PC connection data type**	**Description**	**Remarks**
52	POUT	PC	0.0	R(r/w)	To be connected to the **P**C element connection **OUT**. (For display purposes).	–
54.98	ACTPOS	PC	0.0	R(r/w)	To be connected by any PC element to the AI channel measuring the **ACT**uator **POS**ition.	–
71.119	ABL_H1L1	PC	0	B(r/w)	**A**uto **BL**ock alarms **H1** and **L1**.	See section Application Example in the functional unit manual.
72.131	ABL_H2L2	PC	0	B(r/w)	**A**uto **BL**ock alarms **H2** and **L2**.	See section Application Example in the functional unit manual.
57	PARAM1	system	–	I(r/w)	Group of data to be connected to the PC element connection **PARAM1**.	–
30	PARAM2	system	–	A16(r/w)	Group of data to be connected to the PC element connection **PARAM2**.	–
53.91	PARAM7	system	–	A24(r/w)	Group of data to be connected to the PC element connection **PARAM7** if C1=1.	–

4.6 Operator Functions

The operator functions are divided in principle into 3 parts:

- Presentation (Display elements, Time logged properties)
- Dialog
- Event handling

4.6.1 Presentation

Display elements which can be used for different display types are available for use in the functional unit MANSTN. The display elements show the status and the controls of the process with different degrees of detail and is intended for the following displays:

The display elements show the status and the controls of the process with different degrees of detail and is intended for the following displays:

- Object display
- Group display
- Object closeup display
- Process display

Examples of different display elements which could be used in these displays are given in the following section. A complete list of the prepared elements available is provided in the manual *AdvaCommand User Interface Reference Manual.*

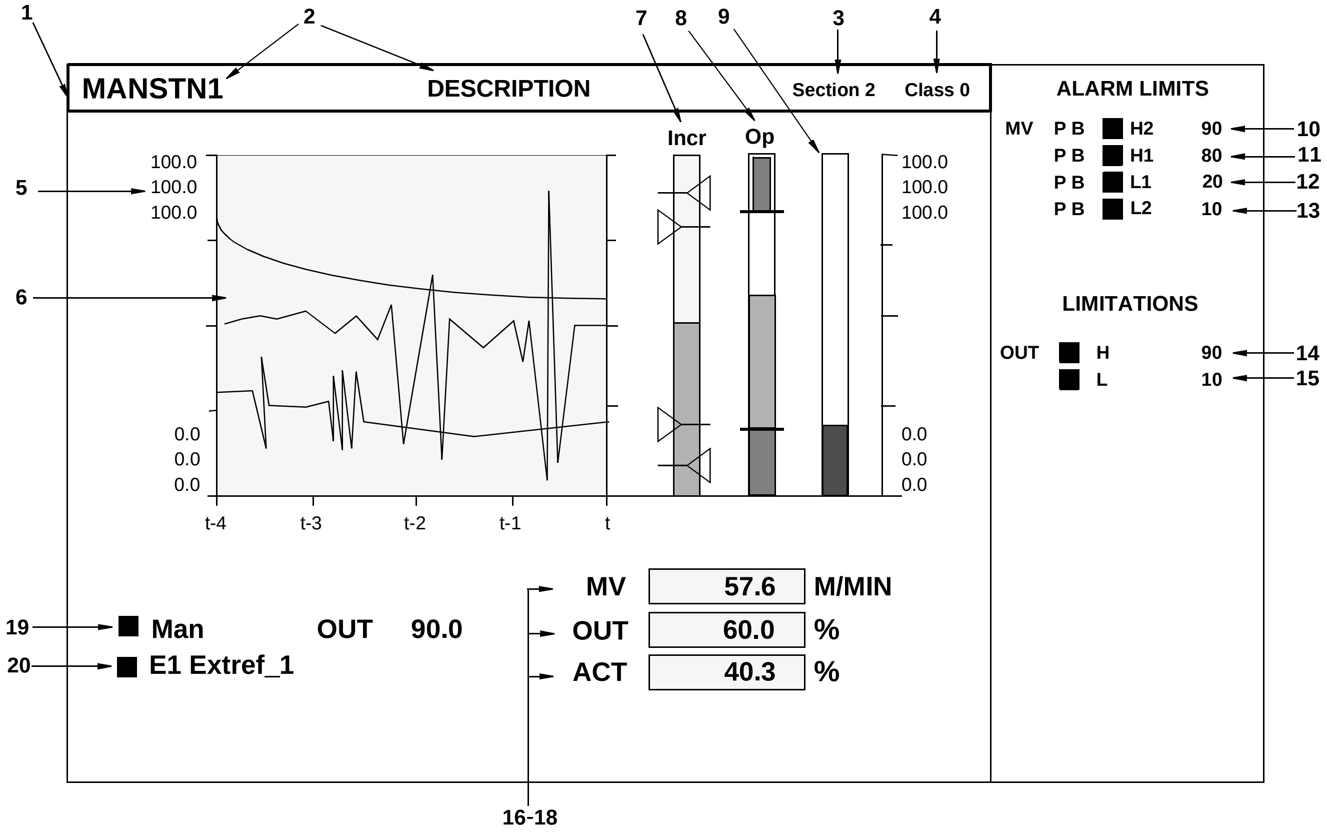
Detailed information about alternative ways of presenting certain status and data within the displays such as color, flashing, blocked etc. is given in the reference manual.

Time-logged Properties

The following measured values can be logged for MANSTN and presented on the display screen:

MV	Measured Value
OUT	Output signal
ACT	Actuator position.

Object display: MANOB01



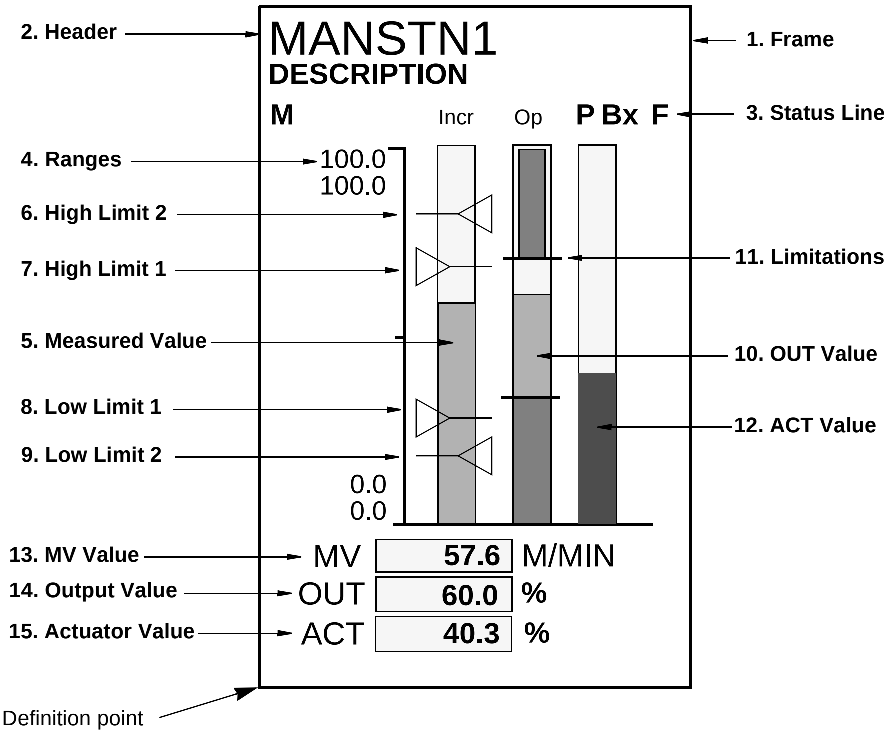
No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3.1	Section Text	
3.2	Section Value	
4.1	Class Text	
4.2	Class Value	
5	Ranges	The actuator ranges are omitted since they always range from 0-100%.
5.1	MV Range Max	
5.2	MV Range Min	
5.3	OUT Range Max	
5.4	OUT Range Min	
5.5	ACT Range Max	

No	Description	Remarks
5.6	ACT Range Min	
6	Measured Value Trim Curve	
	Output Value Trim Curve	
	Output Value Trim Curve	
7.1	Direction	
7.2	Measured Value Bargraph	
7.3	High Limit 2	Alarm High limit 2
7.4	High Limit 1	Warning High limit 1
7.5	Low Limit 1	Warning Low limit 1
7.6	Low Limit 2	Alarm Low limit 2
8.1	Open or Closed	Open or close information
8.2	OUT Value Bargraph	Object actuator value

No	Description	Remarks
8.3	High Limitation	Upper warning limit output
8.4	Low Limitation	Lower warning limit output
9	Actuator Value Bargraph	Object actuator value
10	ALARM LIMITS for MV	
10.1	Printout Blocked	
10.2	Alarm Blocked	
10.3	Alarm Indication	Alarm High limit 2
10.4	H2 Text	
10.5	H2 Value	High limit 2 value
11.1	Printout Blocked	
11.2	Alarm Blocked	
11.3	Alarm Indication	Warning High limit 1
11.4	H1 Text	
11.5	H1 Value	High limit 1 value
12.1	Printout Blocked	
12.2	Alarm Blocked	
12.3	Alarm Indication	Warning Low limit 1
12.4	L1 Text	
12.5	L1 Value	Low limit 1 value
13.1	Printout Blocked	
13.2	Alarm Blocked	
13.3	Alarm Indication	Alarm Low limit 2
13.4	L2 Text	
13.5	L2 Value	Low limit 2 value
14	LIMITATIONS for OUT	

No	Description	Remarks
14.1	OUT Text	
14.2	Warning Indication	Warning Output High
14.3	H Text	
14.4	H Value	Output High value
15.1	Warning Indication	Warning Output High
14.2	L Text	
15.3	L Value	Output High value
16.1	MV Text	
16.2	MV Value	
16.3	MV Unit	
17.1	OUT Text	
17.2	OUT Value	
17.3	OUT Unit	
18	Actuator Value	Actuator value
18.1	ACT	
18.2	ACT Value	
18.3	ACT Unit	
19.1	Man Indication	Manual mode
19.2	Man Text	
19.3	Man Out Text	
19.4	Man Out Value	
20.1	E1 Indication	E1 mode
20.2	E1 Text	Text behind the indication
20.3	E1 Name	User text behind the text E1

Display Element for Group display: MANGR01



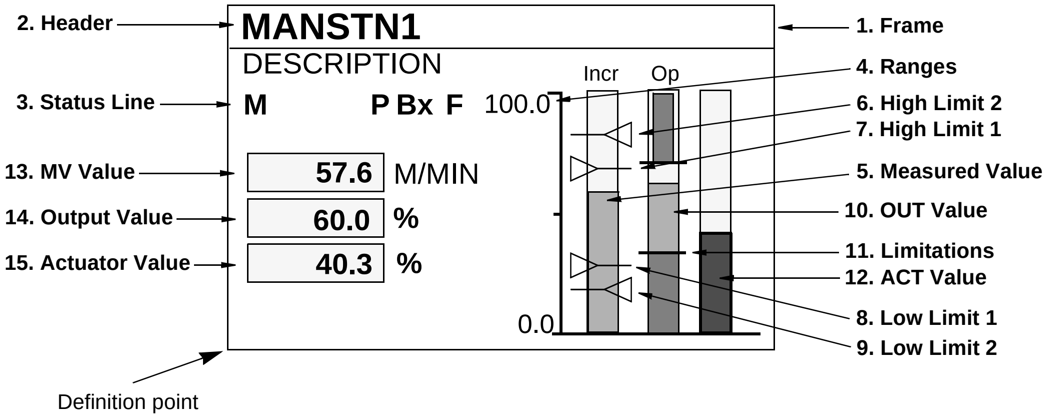
No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	
3.2	Direction	
3.3	Actuator position	
3.4	Printout Blocked	
3.5	Alarm Blocked	
3.6	Alarm Indication	
4	Ranges	The actuator ranges are omitted since they always range from 0-100%.
	MV Range Max	
	MV Range Min	
	Output Range Max	
	Output Range Min	

No	Description	Remarks
5	Measured Value Bargraph	
6	High Limit 2	Alarm High limit 2
7	High Limit 1	Warning High limit 1
8	Low Limit 1	Warning Low limit 1
9	Low Limit 2	Alarm Low limit 2
10	OUT Value Bargraph	Object actuator value
11	Output Limitations	Mesh and limitations lines
11.1	High Limitation	Upper warning limit output
11.2	Low Limitation	Lower warning limit output
12	Actuator Value Bargraph	
13	Measured Value	
13.1	MV	
13.2	MV Value	
13.3	MV Unit	

No	Description	Remarks
14	Output Value	
14.1	OUT	
14.2	OUT Value	
14.3	OUT Unit	

No	Description	Remarks
15	Actuator Value	
15.1	ACT	
15.2	ACT Value	
15.3	ACT Unit	

Display Element for Object closeup display: MANWI01

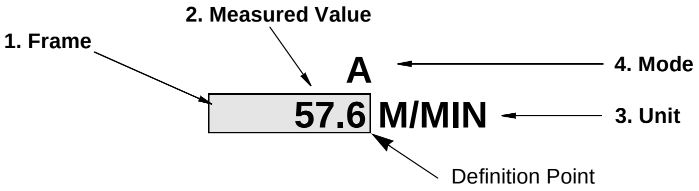


No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	
3.2	Direction	
3.3	Actuator position	
3.4	Printout Blocked	
3.5	Alarm Blocked	
3.6	Alarm Indication	
4	Ranges	The actuator ranges are omitted since they always range from 0-100%.
4.1	MV Range Max	
4.2	MV Range Min	
5	Measured Value Bargraph	
6	High Limit 2	Alarm High limit 2
7	High Limit 1	Warning High limit 1
8	Low Limit 1	Warning Low limit 1
9	Low Limit 2	Alarm Low limit 2

No	Description	Remarks
10	OUT Value Bargraph	Object actuator value
11	Output Limitations	Mesh and limitations lines
11.1	High Limitation	Upper warning limit output
11.2	Low Limitation	Lower warning limit output
12	Actuator Value Bargraph	
13	Measured Value	
13.1	MV	
13.2	MV Value	
13.3	MV Unit	
14	Output Value	
14.1	OUT	
14.2	OUT Value	
14.3	OUT Unit	
15	Actuator Value	
15.1	ACT	
15.2	ACT Value	
15.3	ACT Unit	

Display Element for Process display:

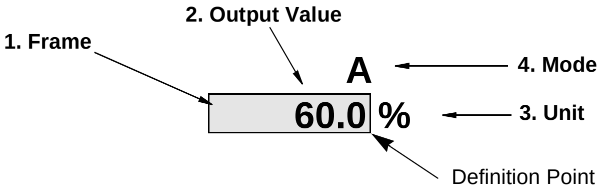
MANPD01



No	Description	Remarks
1	SelectFrame	
2	Measured Value	

No	Description	Remarks
3	Unit	
4	Mode	

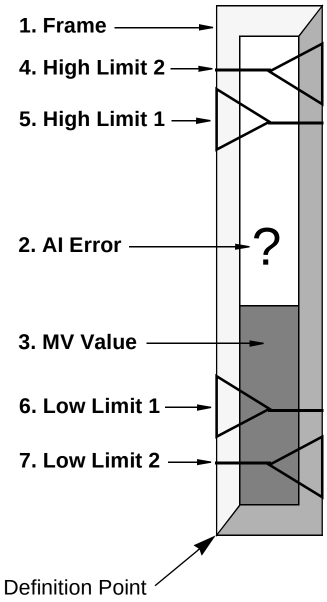
MANPD02



No	Description	Remarks
1	SelectFrame	
2	Output Value	

No	Description	Remarks
3	Unit	
4	Mode	

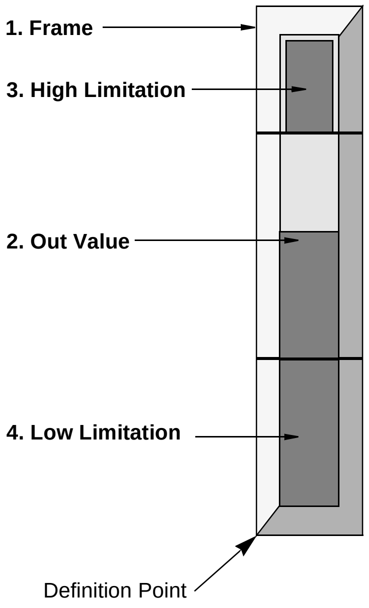
MANPD51



No	Description	Remarks
1.1	SelectFrame	Object frame
1.2	TopLeftEdge	
1.3	BottomRoghtEdge	
2	AI Error	
3	MV Value	

No	Description	Remarks
4	High Limit 2	Alarm High limit 2
5	High Limit 1	Warning High limit 1
6	Low Limit 1	Warning Low limit 1
7	Low Limit 2	Alarm Low limit 2

MANPD52



No	Description	Remarks
1.1	SelectFrame	Object frame
1.2	TopLeftEdge	
1.3	BottomRoghtEdge	

No	Description	Remarks
2	Out Value	
3	High Limitation	Upper warning limit output
4	Low Limitation	Lower warning limit output

4.6.2 Dialog

The display screen is supplemented with a keyboard for operator communication with the functional unit/object.The dialog is built up using both fixed and dynamic keys. The functions available with the dynamic keys are presented in a pattern of rectangles on the lower part of the display screen when the object is selected. The functional unit MANSTN has a MIN dialog (Production level) and a MAX dialog (Maintenance level). The MIN dialog consists of an output dialog with 1 subdialog. The MAX dialog consists of an output dialog with 3 subdialogs.

MIN dialog (No authority key)

Keyboard keys

+ ↑	**Increase**	Increase output value with 0.5%
⇧ Shift **+** + ↑		Increase output value with 5.0%
↓ −	**Decrease**	Decrease output value with 0.5%
⇧ Shift **+** ↓ −		Decrease output value with 5.0%
Man	**Man**	Set to manual mode
E1	**E1**	Set to external1 mode
✓	**Acknowledge**	Acknowledge alarm
Object	**Object Display**	Select Object Display
📈	**Object Trend**	Select Object Trend
Dialog	**Previous Level**	Select Top Level dynamic keys

Dynamic keys, Top Level

D1	D2	D3	D4	D5
D6 OUT	D7	D8	D9	D10 *Keyboard…*

OUT	Check/change output value
Keyboard…	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard

D1 ↑ Increase	D2 Man	D3	D4 E1	D5
D6 ↓ Decrease	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Increase	Increase output value with 0.5%
Man	Set to manual mode
E1	Set to external1 mode
Decrease	Decrease output value with 0.5%
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

MAX dialog (Authority key)

Keyboard keys

+ ↑	**Increase**	Increase output value with 0.5%
⇧ Shift **+** + ↑		Increase output value with 5.0%
↓ −	**Decrease**	Decrease output value with 0.5%
⇧ Shift **+** ↓ −		Decrease output value with 5.0%
Man	**Man**	Set to manual mode
E1	**E1**	Set to external1 mode
✓	**Acknowledge**	Acknowledge alarm
Object	**Object Display**	Select Object Display
📈	**Object Trend**	Select Object Trend
Dialog	**Previous Level**	Select Top Level dynamic keys
Dialog	**Next Block**	Page between the subdialogs

Dynamic keys, Top Level

D1	D2	D3	D4 *Block…*	D5 *Limits…*
D6 OUT	D7	D8	D9	D10 *Keyboard…*

Block…	Select Dynamic keys: Block
Limits…	Select Dynamic keys: Limits
OUT	Check/change output value
Keyboard…	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard

D1 ↑ Increase	D2 Man	D3	D4 E1	D5
D6 ↓ Decrease	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Increase	Increase output value with 0.5%
Man	Manual mode
E1	External1 mode
Decrease	Decrease output value with 0.5%
Acknowledge	Acknowledge alarm
Object Display	Select object display
Object Trend	Select object trend

Dynamic keys, Block…

D1 Block Alarm 1	D2 Block Printout 1	D3	D4 Block Alarm 2	D5 Block Printout 2
D6 Deblock Alarm 1	D7 Deblock Printout 1	D8	D9 Deblock Alarm 2	D10 Deblock Printout 2

Block Alarm 1	Block alarm 1 indication
Block Printout 1	Block event 1 printout
Block Alarm 2	Block alarm 2 indication
Block Printout 2	Block event 2 printout
Deblock Alarm 1	Deblock alarm 1 indication
Deblock Printout 1	Deblock event 1 printout
Deblock Alarm 2	Deblock alarm 2 indication
Deblock Printout 2	Deblock event 2 printout

Dynamic keys, Limits…

D1 H1 80.00	D2 H2 90.00	D3	D4	D5 OUT H 90.00
D6 L1 20.00	D7 L2 10.00	D8	D9	D10 OUT L 10.00

H1	Check/change measured value warning limit H1
H2	Check/change measured value alarm limit H2
OUT H	Check/change upper warning limit output
L1	Check/change measured value warning limit L1
L2	Check/change measured value alarm limit L2
OUT L	Check/change lower warning limit output

4.6.3 Event Handling

This chapter contains a description of all alarms and events in the functional unit MANSTN.

All these alarms and events are divided into groups. For each of these groups, there is an EVENT_TREAT pointer in the data base element. This pointer indicates a data base element of type EVENT_TREAT in Advant Station 500 Series Operator Station where the processing of the events of the group is defined. In the table on the next page, the allocation of pointers to the different events and alarms is set out, which are defined for PIDCON. The table also shows the standard texts obtained in the event and alarm messages and the pointer numbers to user-defined texts in the EVENT_TREAT element indicated. The latter is of interest in case the standard texts are not suitable. The different event groups are described below:

Events of type 1 include passage of alarm limits L1, H1. An alarm is registered in the alarm list and event list when an error status is detected and in the event list when it disappears. The event handling in operator station can be blocked with the dialog (BLK H1/L1) or by applying a logic signal 1 at the PC-input ALCBLK in MANSTN, or by applying a logical ’1’ to the input ABL_H1L1 on the data base element.

Events of type 2 include passage of alarm limits L2, H2. An alarm is registered in the alarm list and event list when an error status is detected and in the event list when it disappears. The event handling can be blocked with the dialog (BLK H2/L2) or by applying a logical signal 1 at the PC-input ALCBLK in MANSTN, or by applying a logical ’1’ to the input ABL_H2L2 on the data base element.

Events of type 4 are only errors in the measured value, AIERR. An alarm is registered in the alarm list and event list when an error status is detected and in the event list when it disappears . The event handling cannot be blocked.

Table 4-2. Event Texts for MANSTN

Events	**Event Treat pointer**	**Property text**		**Event text**	
		Standard text	**Line No in Event Treat**	**Standard text**	**Line No in Event Treat**
Lower limit L1 for measured value exceeded	H1L1_TR	MV<L1	1	<Value> <Unit>	1
Lower limit L1 for measured value re-entered	H1L1_TR	MV<L1	1	<Value> <Unit>	2
Upper limit H1 for measured value exceeded	H1L1_TR	MV>H1	2	<Value> <Unit>	1

Table 4-2. Event Texts for MANSTN

Events	**Event Treat pointer**	**Property text**		**Event text**	
		Standard text	**Line No in Event Treat**	**Standard text**	**Line No in Event Treat**
Upper limit H1 for measured value re-entered	H1L1_TR	MV>H1	2	<Value> <Unit>	2
Lower limit L2 for measured value exceeded	H2L2_TR	MV<L2	1	<Value> <Unit>	1
Lower limit L2 for measured value re-entered	H2L2_TR	MV<L2	1	<Value> <Unit>	2
Upper limit H2 for measured value exceeded	H2L2_TR	MV>H2	2	<Value> <Unit>	1
Upper limit H2 for measured value re-entered	H2L2_TR	MV>H2	2	<Value> <Unit>	2
AI-error On	ERR_TR	AISign Err	1	Alarm	1
AI-error Off	ERR_TR	AISign Err	1	Normal	2

4.6.4 Group Alarm

It is possible to connect the functional unit MANSTN to the group alarm function. This function makes it possible to gather alarms and events from related process signals and objects into Alarm Groups. These groups are then treated as objects.

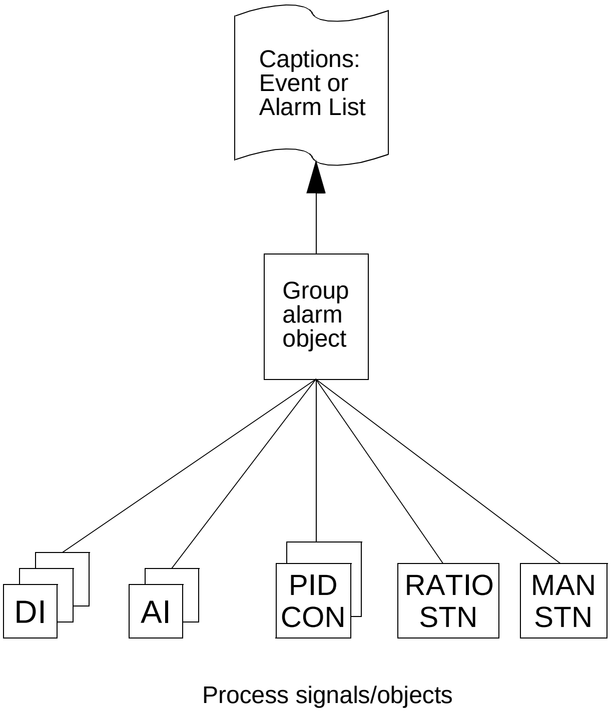


Figure 4-11. Group Alarm

The group alarm function consists of four parts as follows:

- Grouping of process alarms and events with a view to creating pilot alarms and events
- Blocking of groups
- Automatic acknowledgement
- External alarm outputs

For a more detailed description of the group alarm function, reference is made to the manual *AdvaCommand Basic Functions User's Guide*.

4.7 Application Example

See the manual *MasterPiece 280 Application Notes.*

Particularly special applications of certain properties of the functional unit are commented on in the following:

- Control of the measured value measurement range.

  If, in certain cases, the parameter MAX or MIN in the data base element is controlled from a PC-program to obtain improved resolution in the presentation of staples on the display screen, the following rule must be observed:

  – Staples are only scaled at exchange of display. I.e. to obtain the required function, it may be necessary for the operator to exchange the display. E.g. when a measured value changes and enters the smaller measurement range while the display is on the screen.

- Control of output signal presentation area.

  Parameters PO_MAX and PO_MIN respectively can be controlled from PC-programs to obtain, in certain operational cases, improved resolution in the presentation of staples on the display screen. In this case also, staples are only scaled with change of display.

- Three different ways for PC programs to block alarms.

  – The alarm can be blocked by applying a control signal to the input ALCBLK of the PC element. In this way, the signal outputs from the PC element, MV_GT_H2, MV_GT_H1, MV_LT_L1, MV_LT_L2, are also blocked. However, no indication of this is obtained on the displays.

  – Alarms can be blocked by applying a control signal to the input ALCBLK of the PC element and to the terminals ABL_H1L1 and ABL_H2L2 of the data base element. In this way, both blocking of the signal outputs and indication on the displays are obtained.

  – If alarms are blocked by connecting a control signal to ABL_H1L1 and ABL_H2L2 only, this is indicated on displays but the signals outputs from the PC element stay unaffected.

4.8 Function Diagram

The function diagram in section A.4 in Appendix A describes in detail the relation between all of the signals within the functional unit.

Appendix A Function Diagrams

A.1 Display Explanation

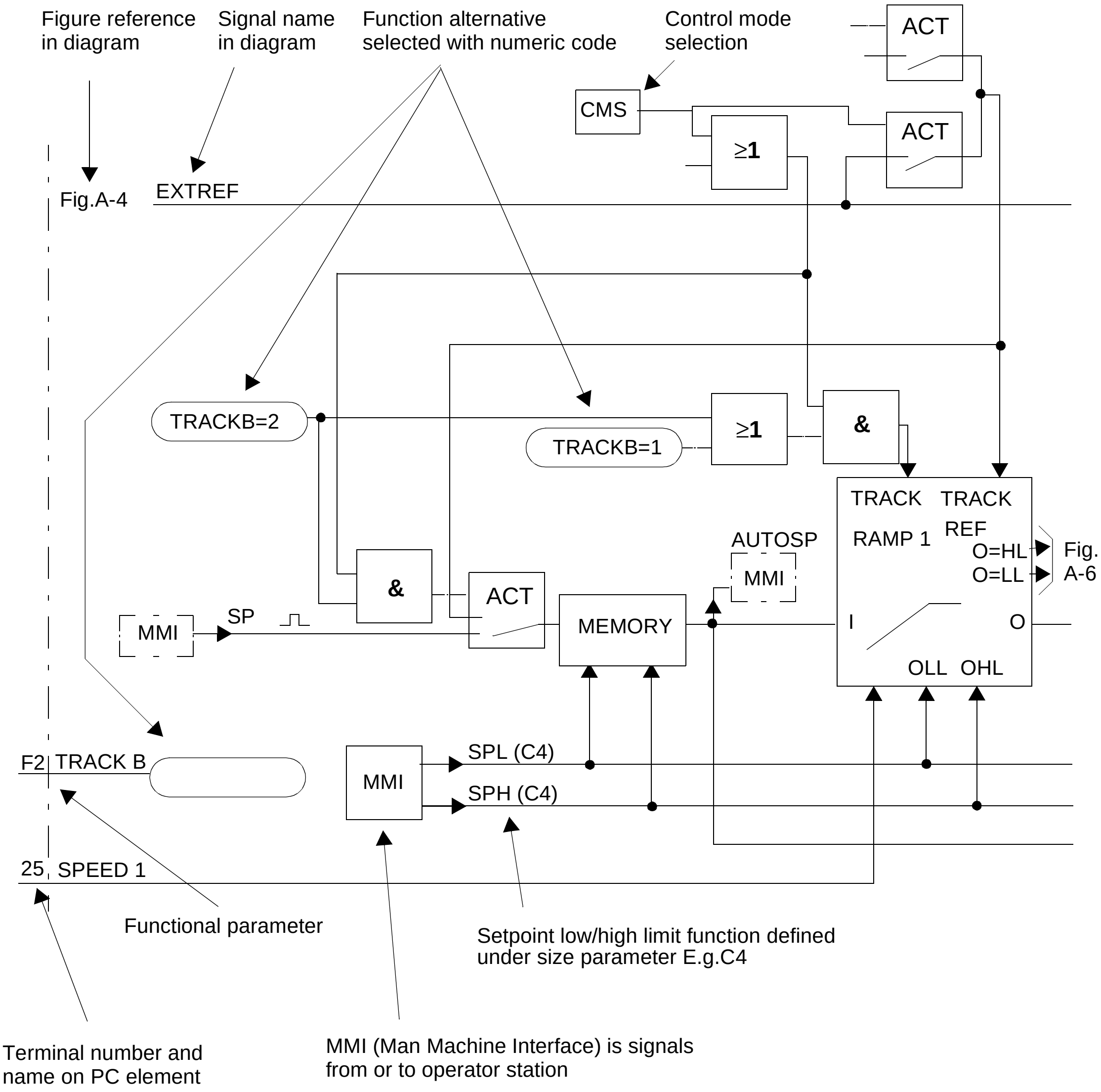


Figure reference in diagram
Signal name in diagram
Function alternative selected with numeric code
Control mode selection
ACT
CMS
≥1
ACT
Fig.A-4
EXTREF
TRACKB=2
≥1
&
TRACKB=1
TRACK
TRACK
REF
RAMP 1
O=HL
O=LL
Fig. A-6
AUTOSP
MMI
&
ACT
MEMORY
MMI
SP
I
O
OLL
OHL
F2
TRACK B
MMI
SPL (C4)
SPH (C4)
25
SPEED 1
Functional parameter
Setpoint low/high limit function defined under size parameter E.g.C4
Terminal number and name on PC element
MMI (Man Machine Interface) is signals from or to operator station

Figure A-1. Explanation of Symbols in Function Diagrams

A.2 PIDCON

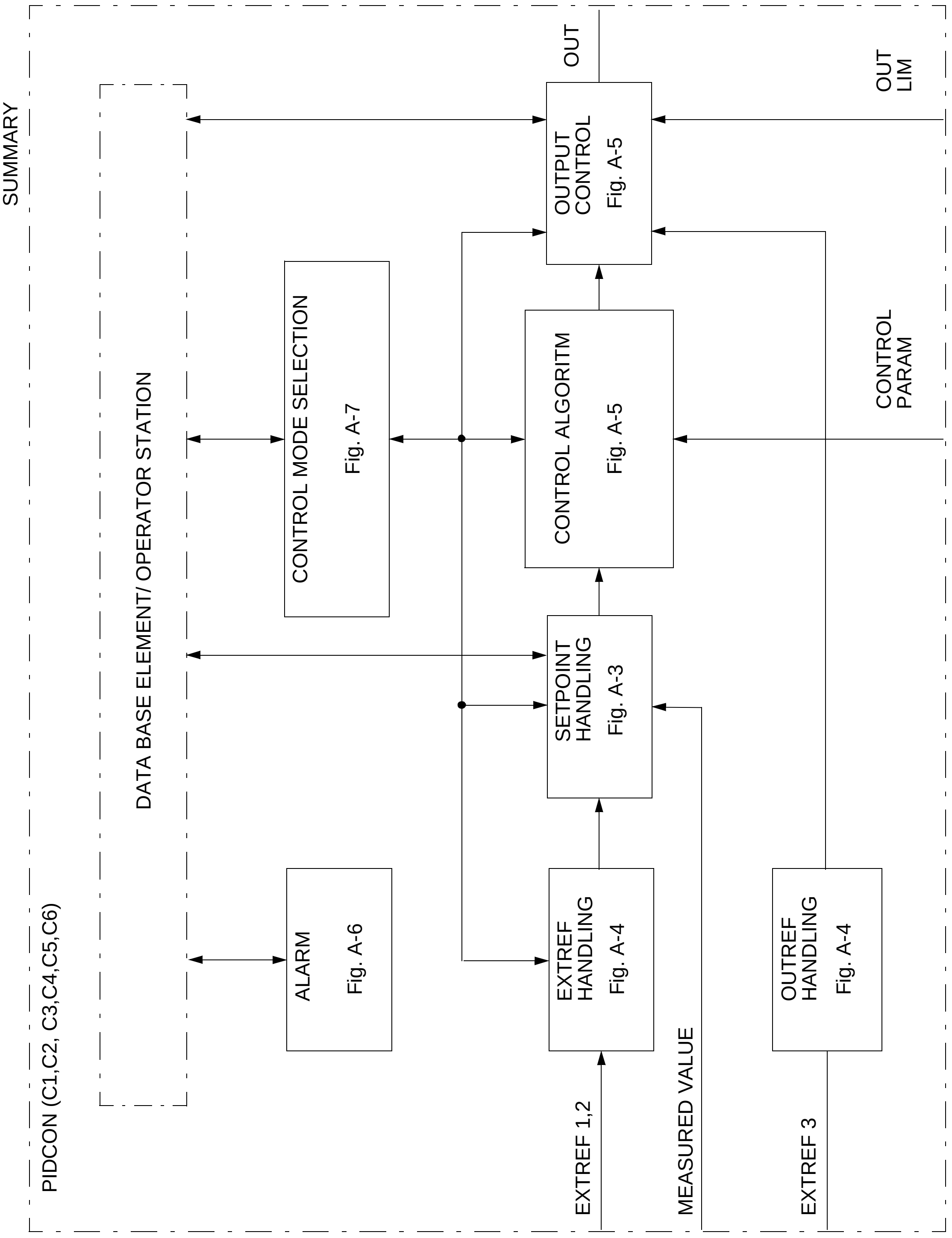


Figure A-2. Summary

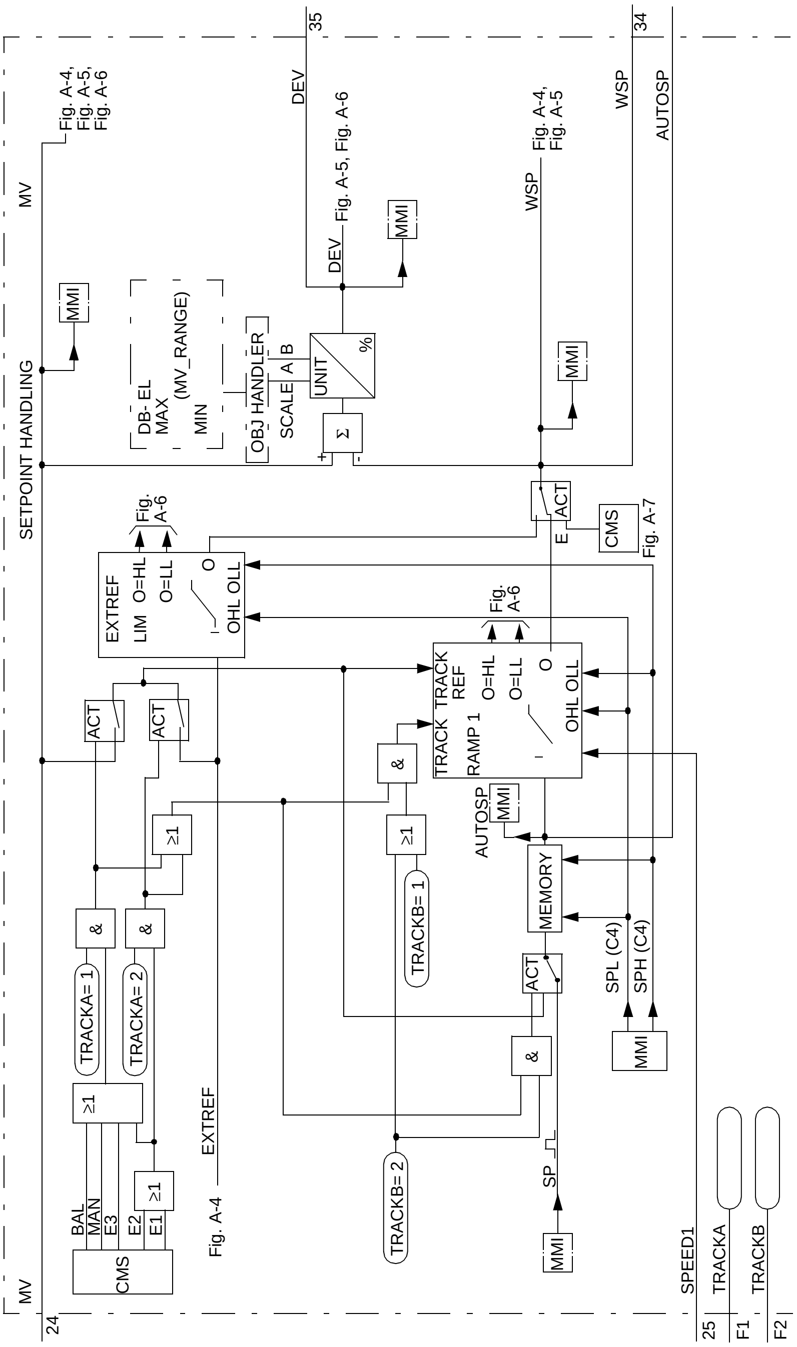


Figure A-3. Setpoint handling

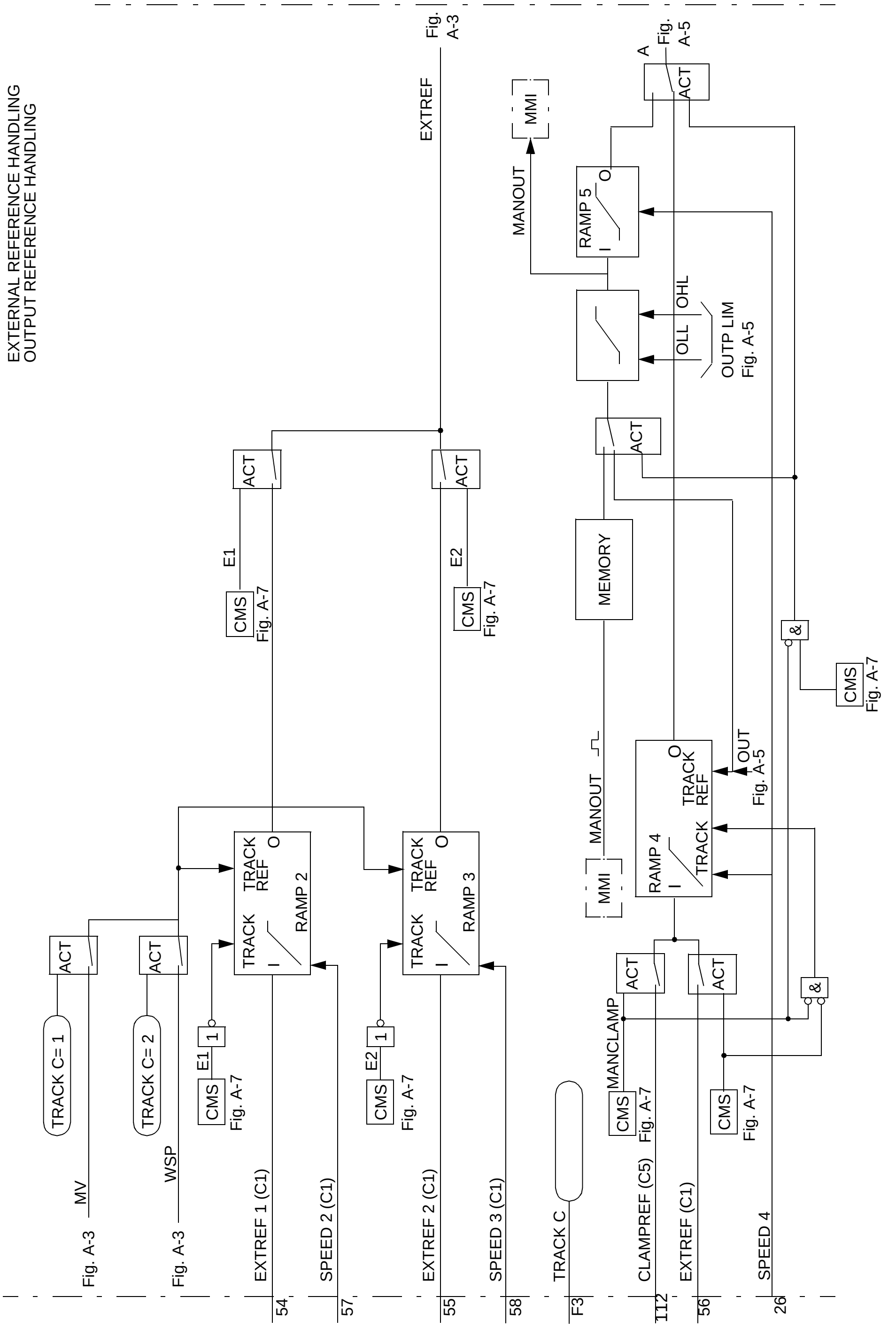


Figure A-4. External reference handling/Output reference handling

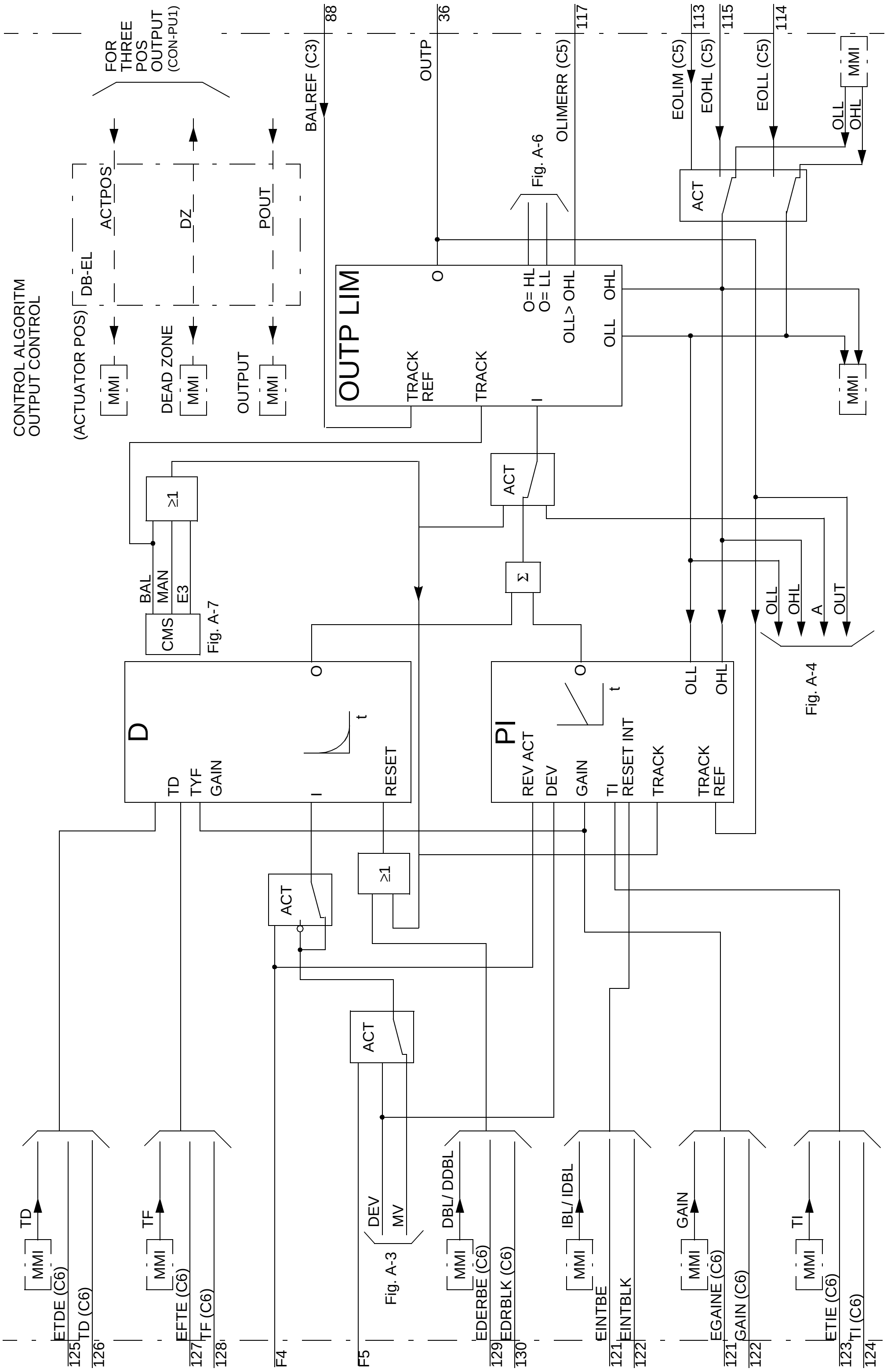


Figure A-5. Control algorithm/Output control

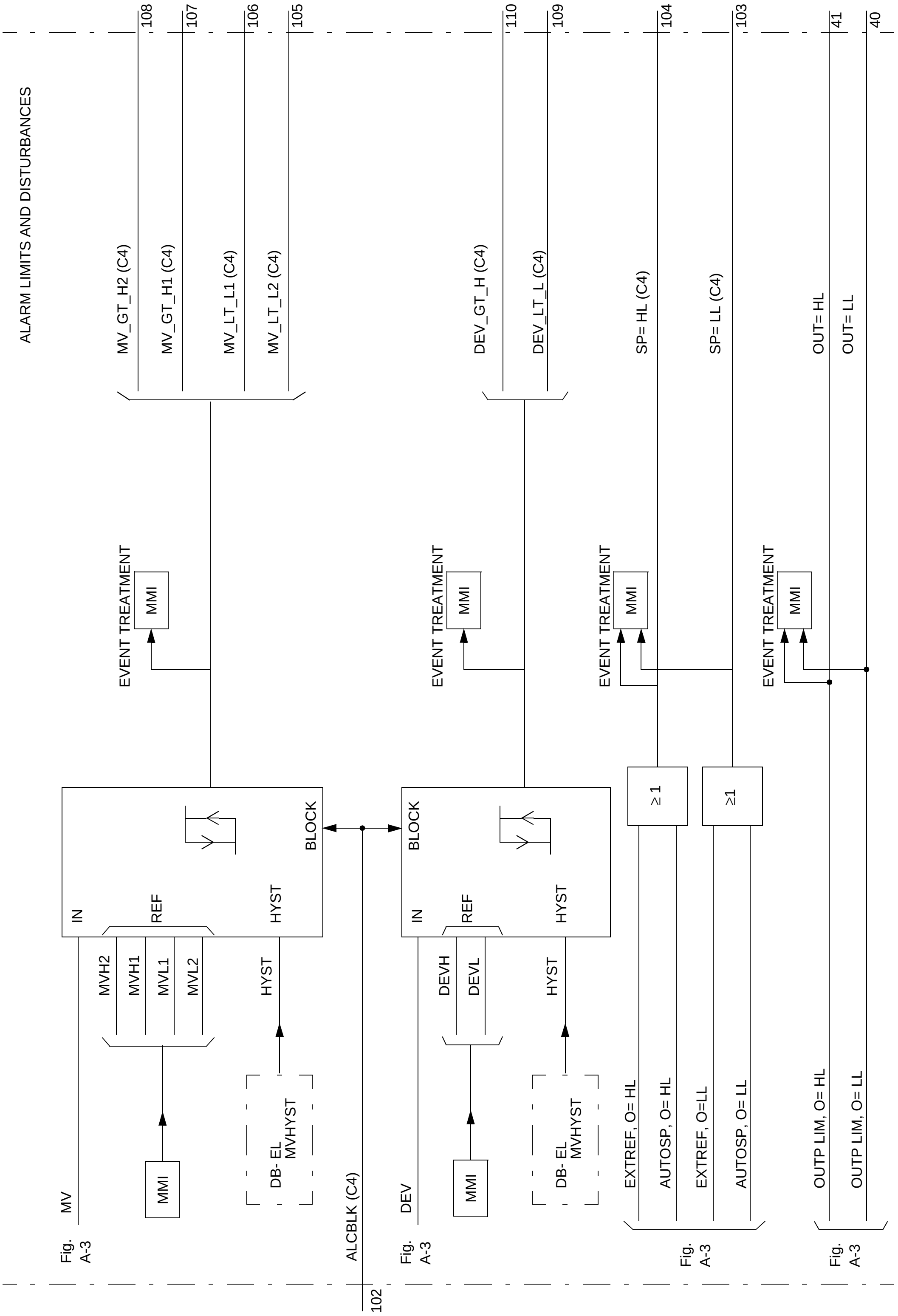


Figure A-6. Alarm limits and disturbances

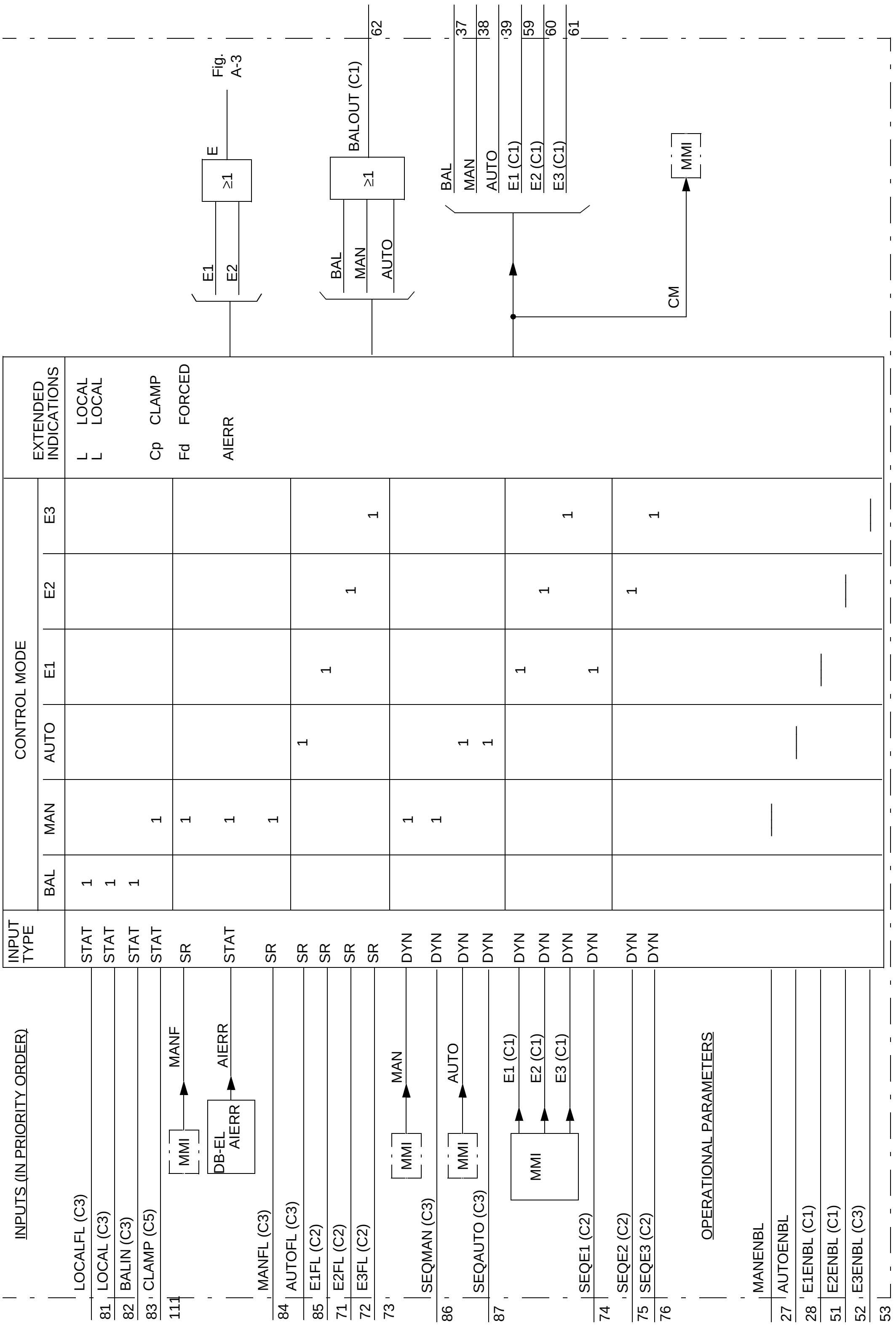


Figure A-7. Control modes selection, CMS

A.3 RATIOSTN

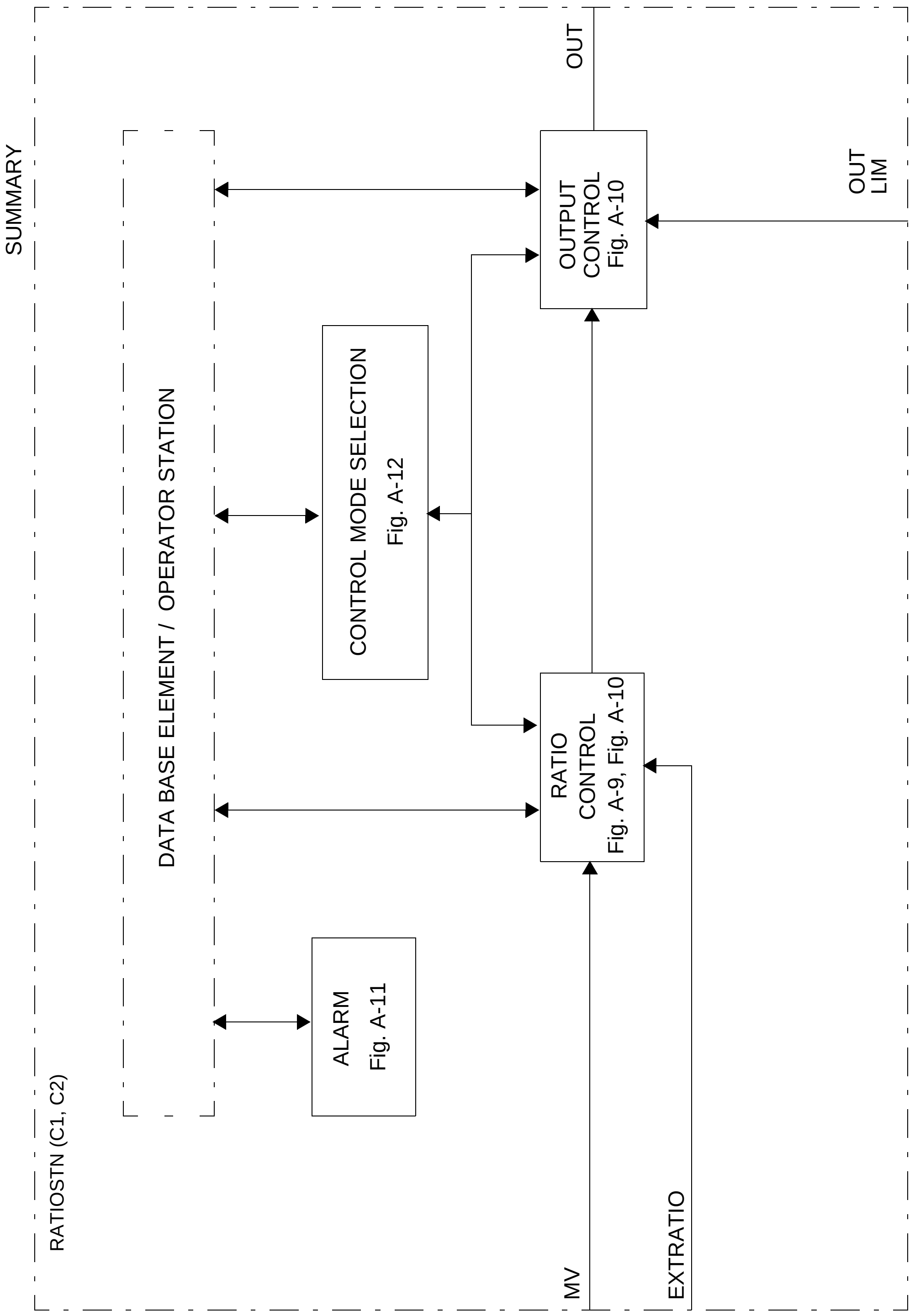


Figure A-8. Summary

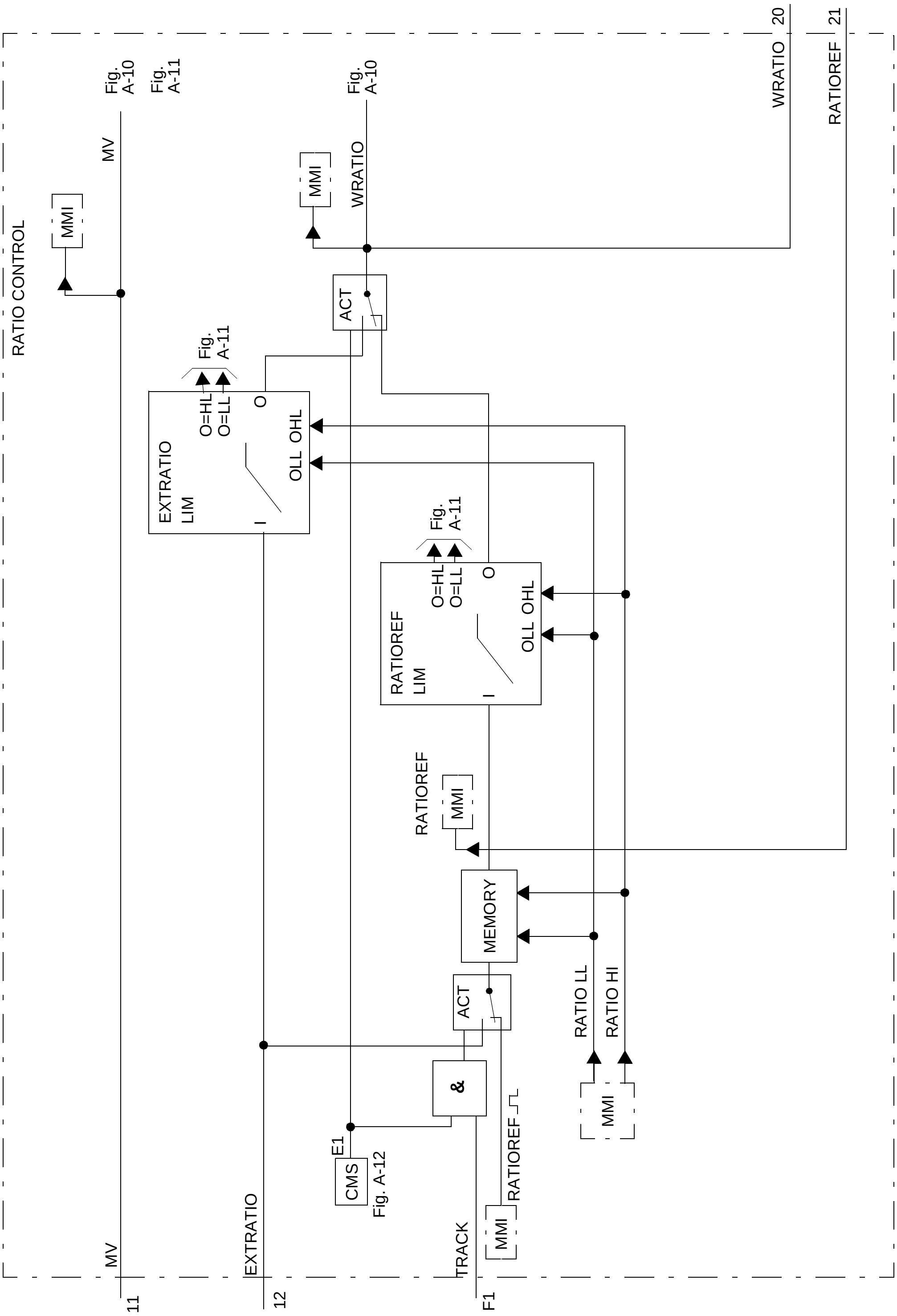


Figure A-9. Ratio Control

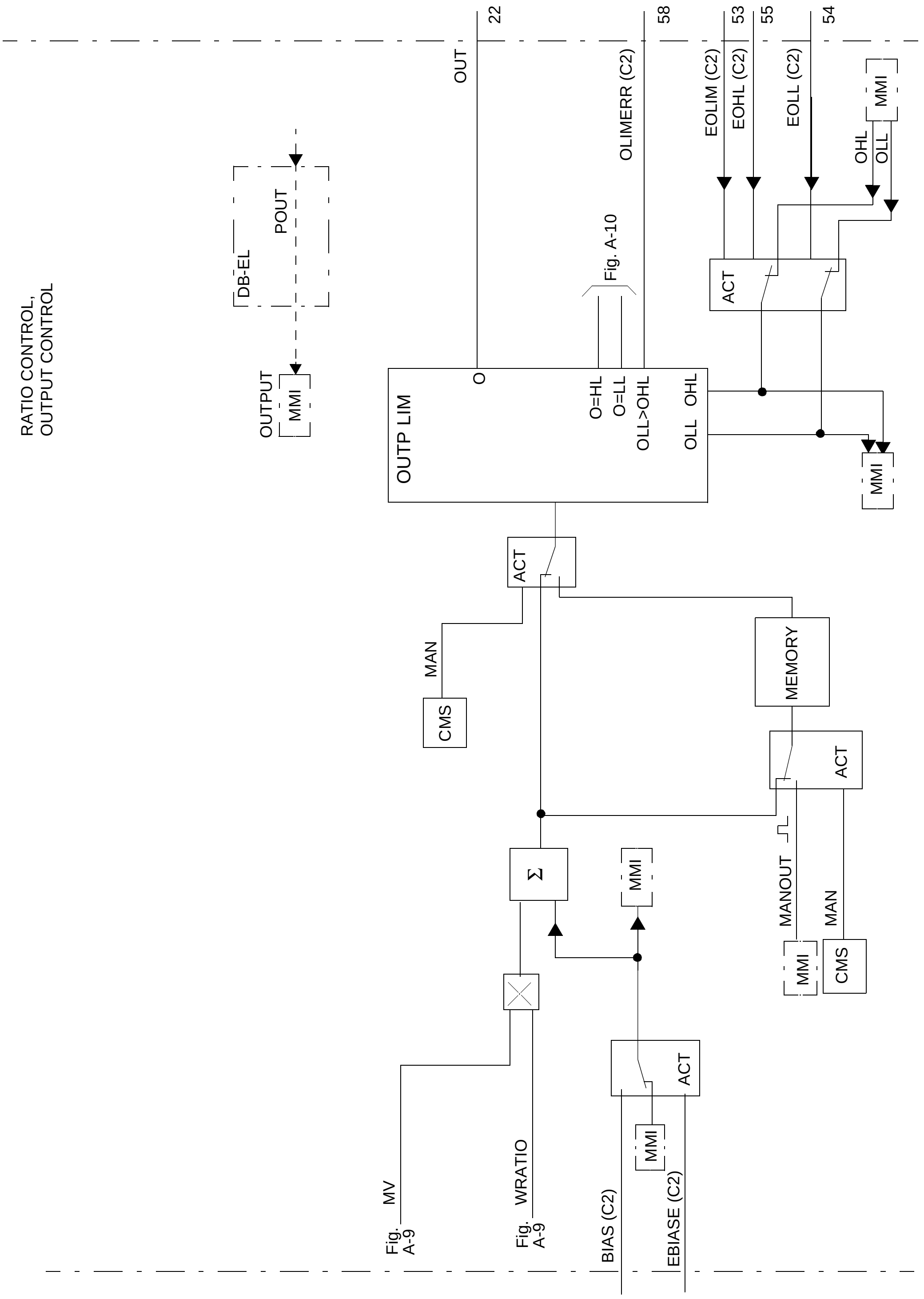


Figure A-10. Ratio control/Output control

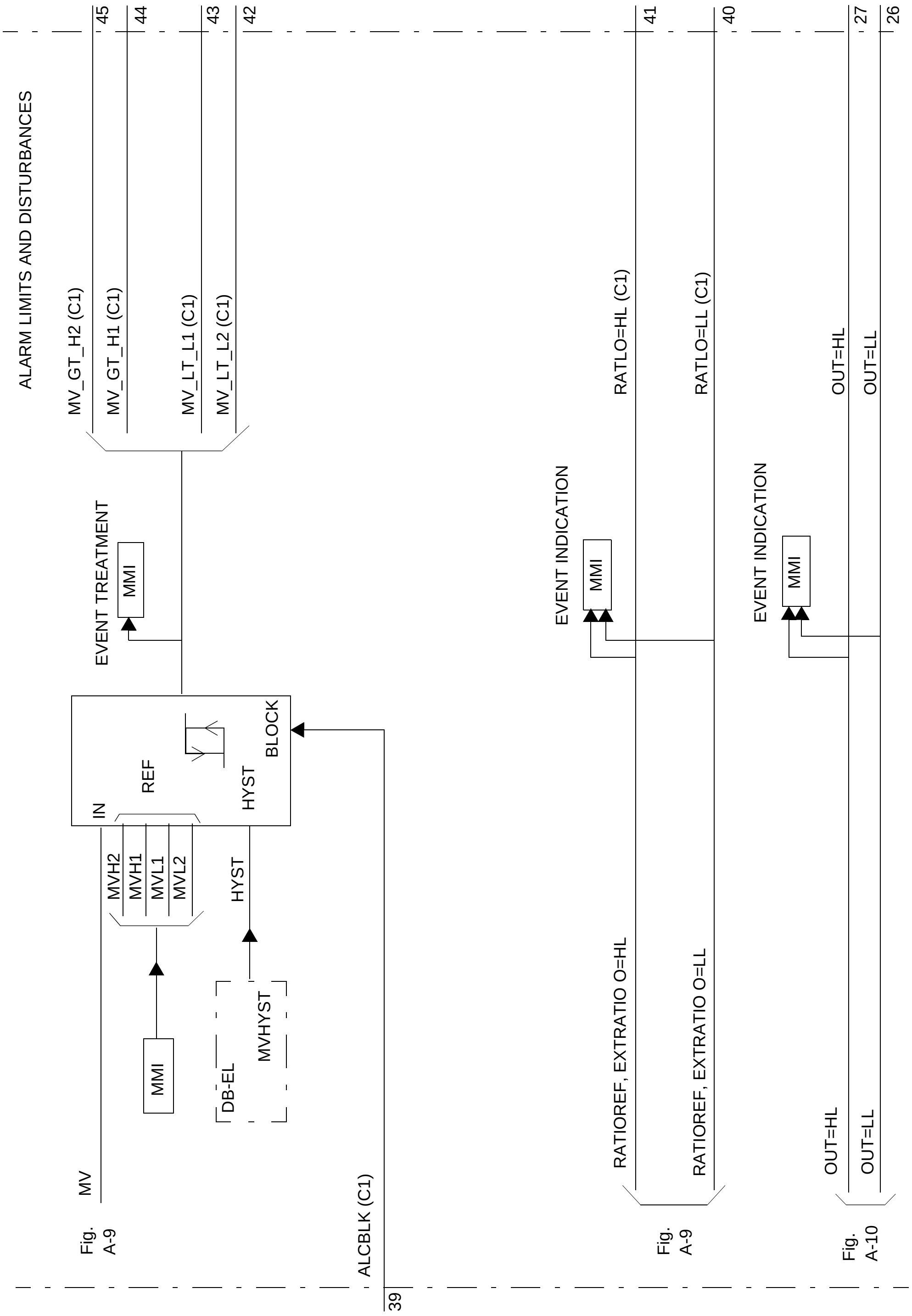


Figure A-11. Alarm limits and disturbances

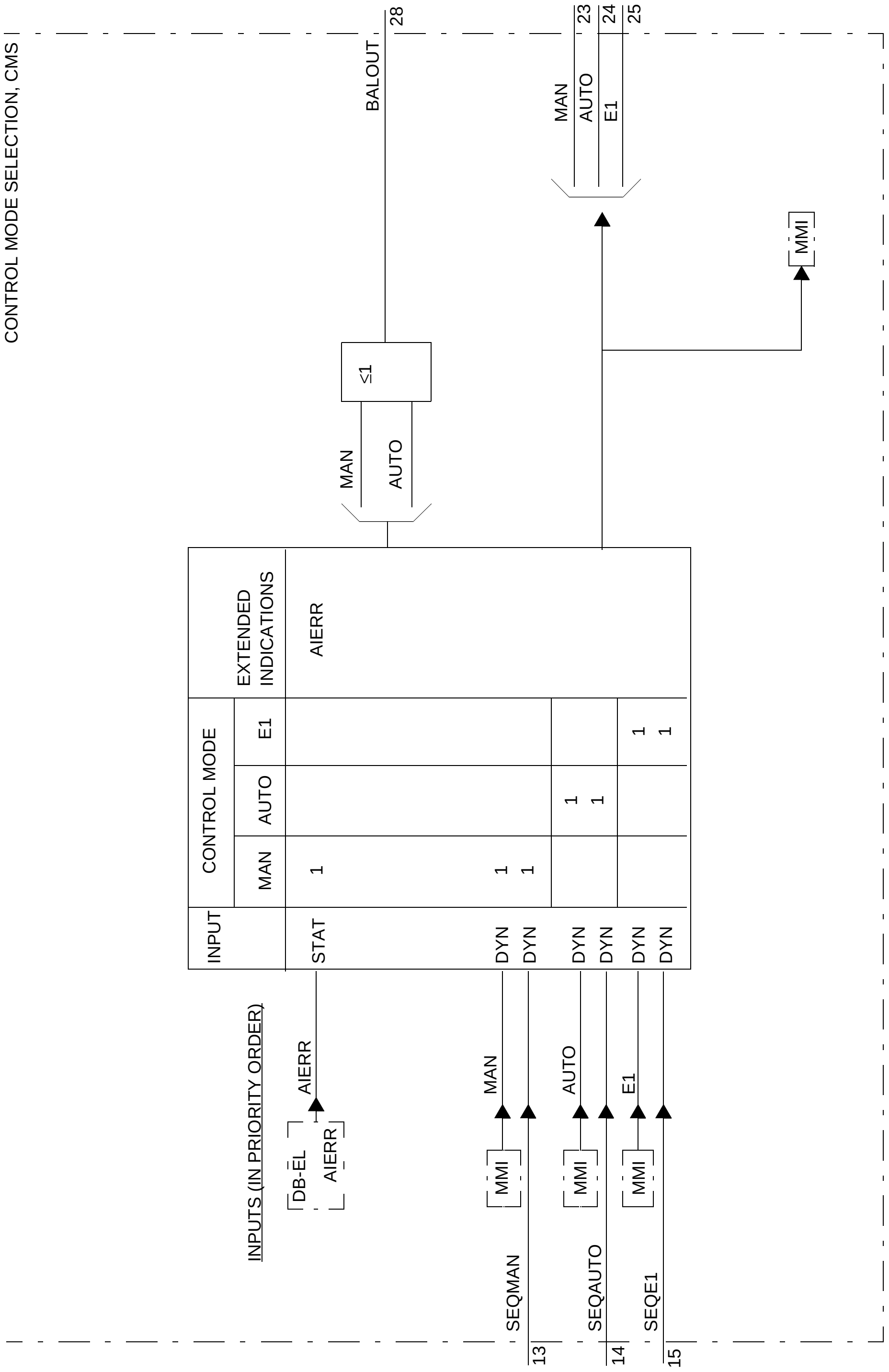


Figure A-12. Control modes selection, CMS

A.4 MANSTN

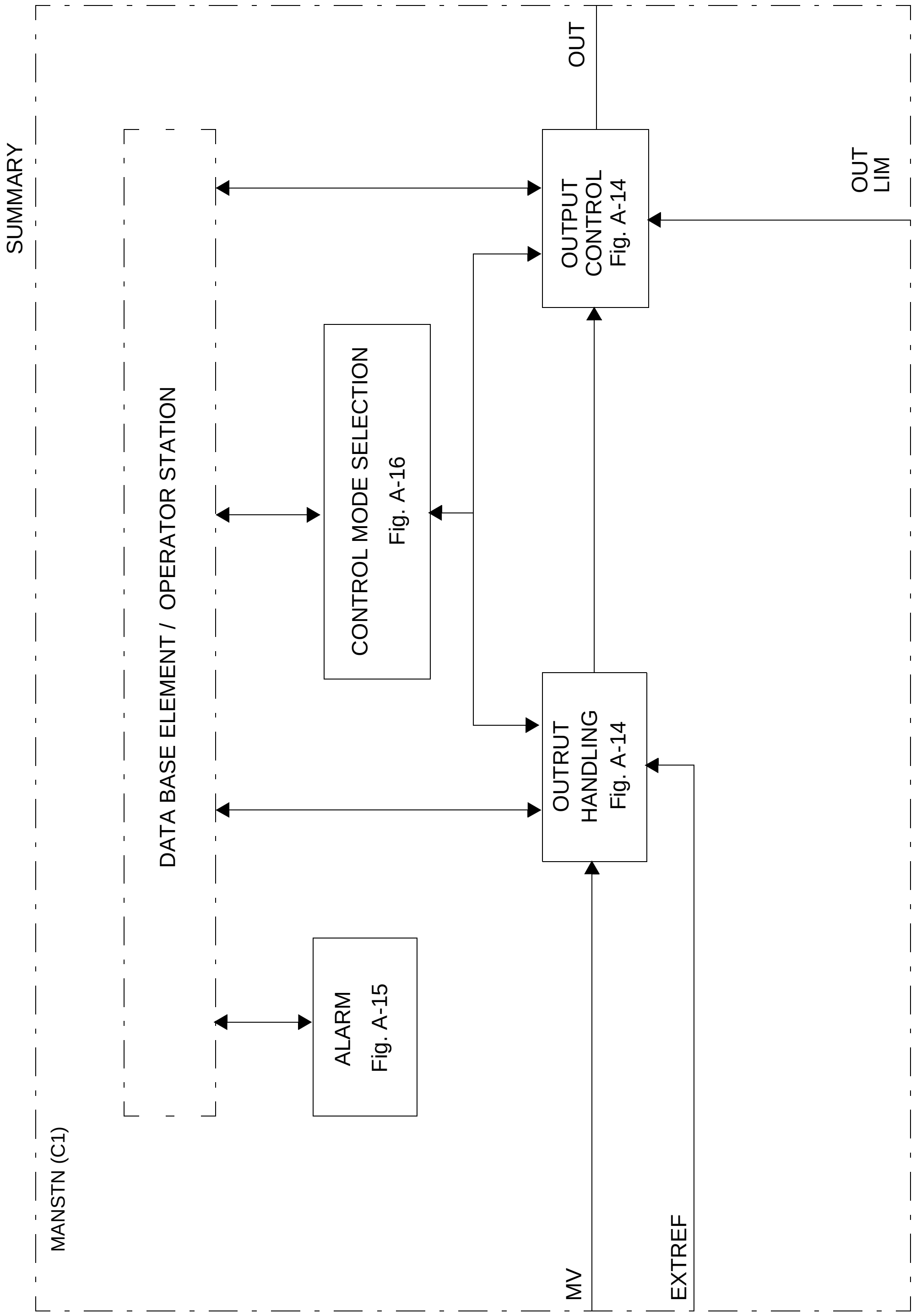


Figure A-13. Summary

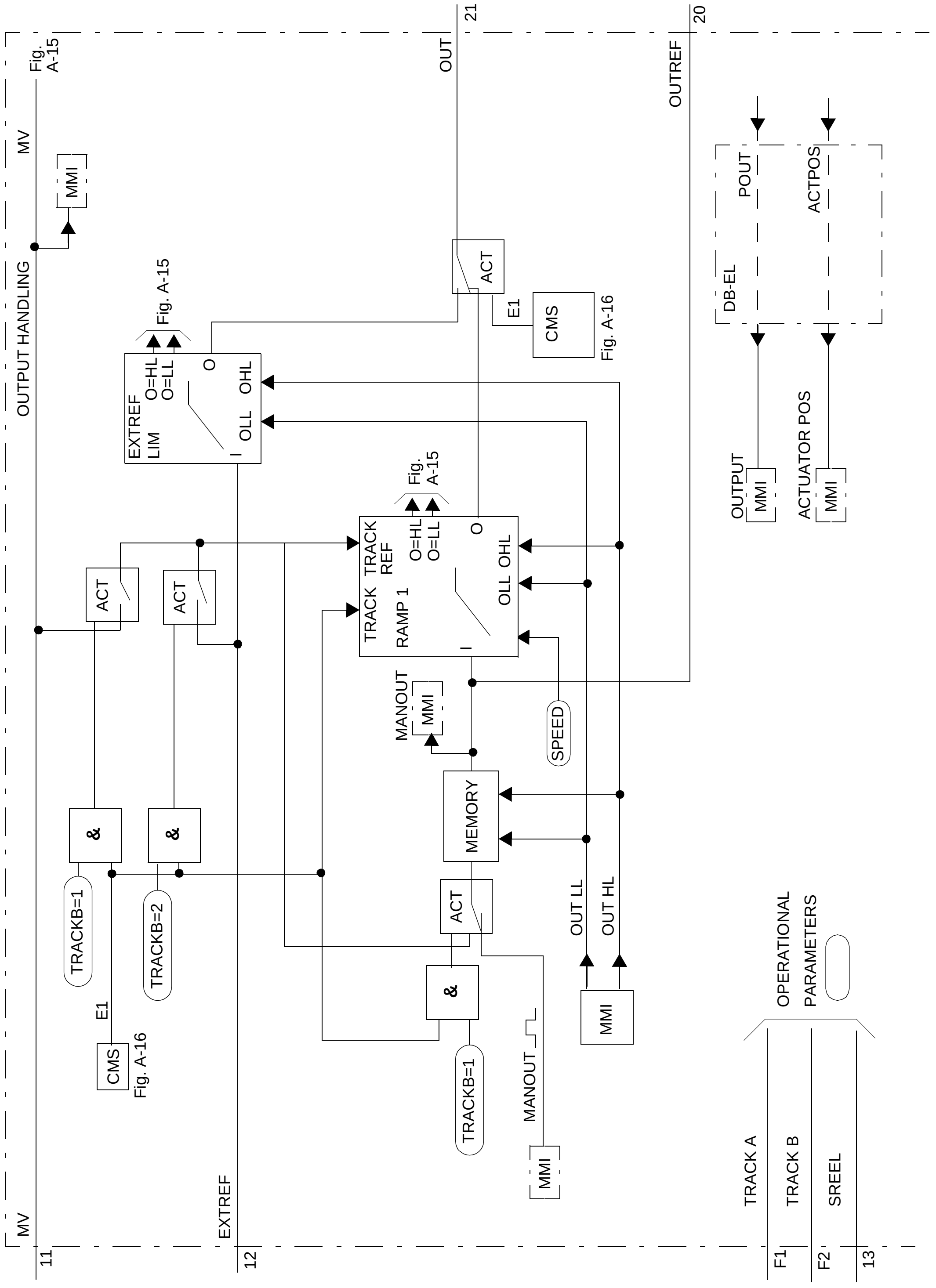


Figure A-14. Output handling

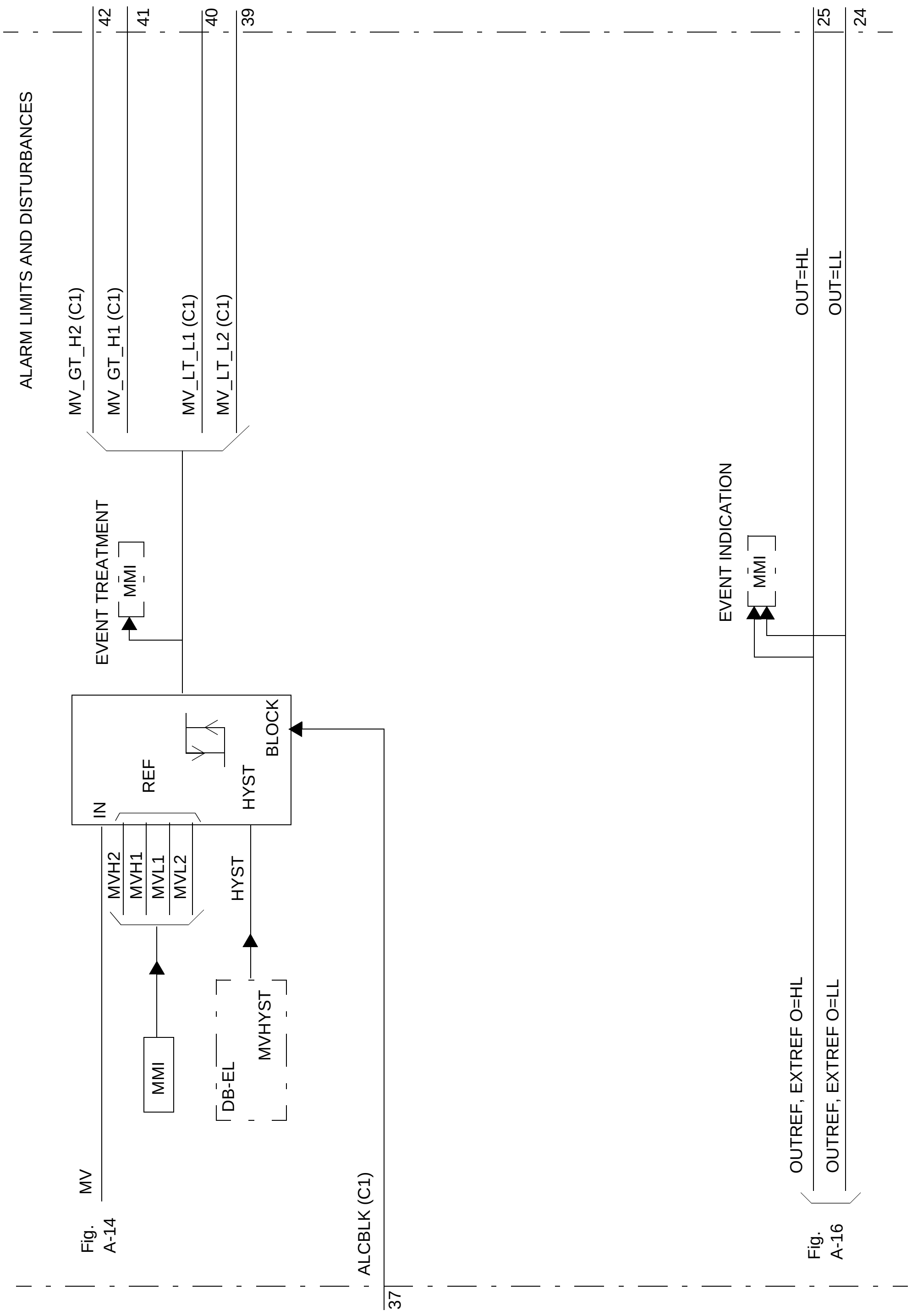


Figure A-15. Alarm limits and disturbances

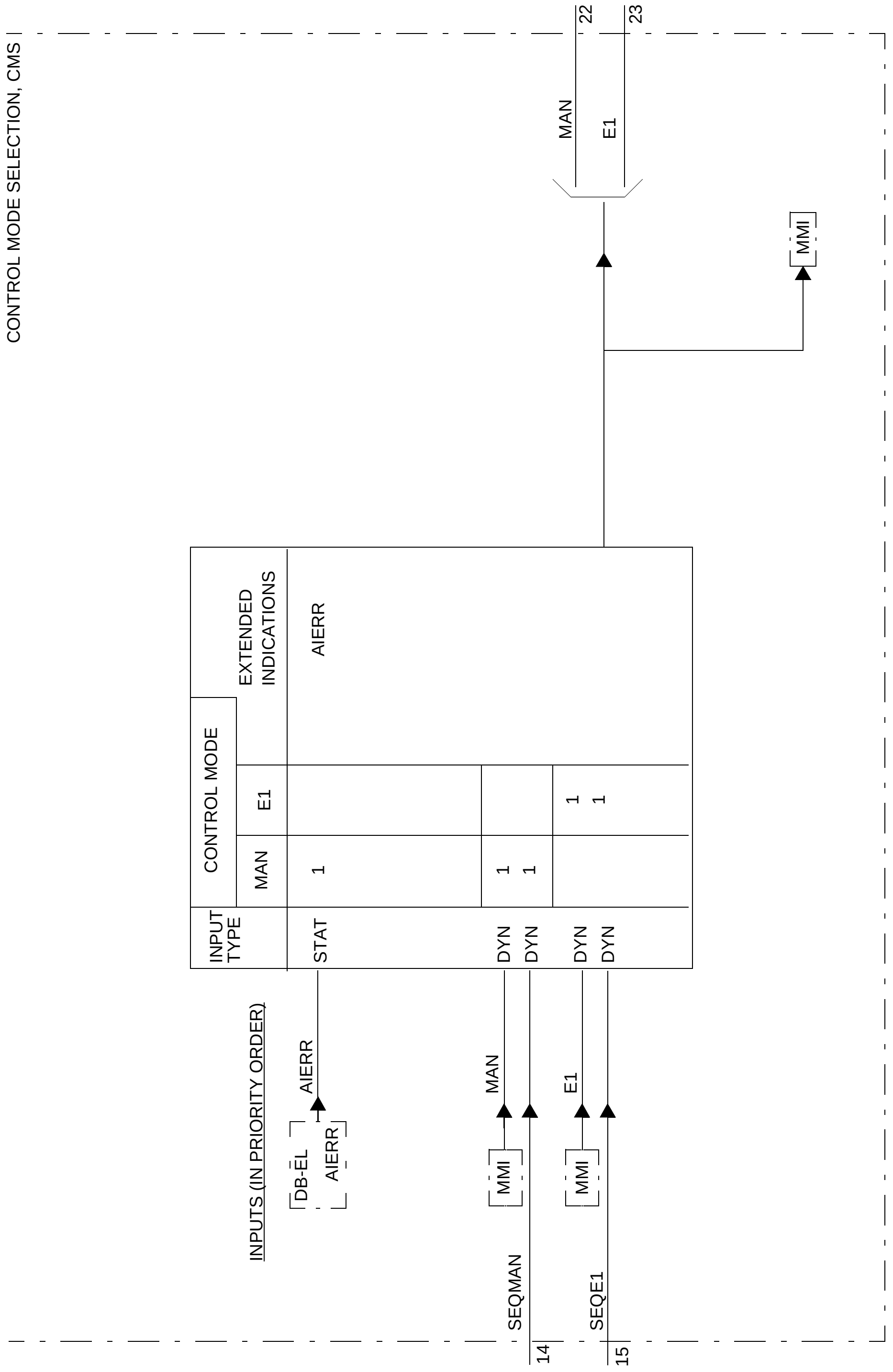


Figure A-16. Control modes selection, CMS

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